The Mining Journal

London, September 13, 1957

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Vol. 249 **No. 6369**

Established 1835

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Published each Friday by
THE MINING JOURNAL LTD.

Directors
E. Baliol Scott *(Chairman)* U. Baliol Scott *(Managing)*
G. A. Baliol Scott R. A. Ellefsen

15, WILSON STREET,
LONDON, E.C.2.

Telegraphic Tutwork London
Telephone MONarch 2567 (3 lines)

Annual Subscription £2 10s. Single copy ninepence

How Far Can Copper Fall?

WHERE is the fall in copper going to stop? In mid-week a rally was staged but there is no evidence that the price has touched bottom and everything points that it has not. There are two ways of looking at the problem. One can assess the economic and political factors which are playing on the market; and one can try and judge the psychology of the situation. It is easier to do the former, but probably more rewarding to do the latter.

Undoubtedly in the United Kingdom the general economic-political situation is fraught with uncertainty. In the first place there is the general uncertainty as to the trend. It is probably fair to say that the deflationary forces which seemed to be important in the spring and early summer have been over-estimated. What is not at all clear is whether the economy is plunging further into inflation or whether it is beginning to climb out of it.

In the current fashionable controversy as to whether we are suffering from cost-inflation or demand-inflation, the government is showing, by the factors to which it is pinning its hopes, that it tends to the former view; but it would be probably true to say that the weight of academic and business opinion is more heavily lined up behind the latter. In a real sense this is a highly academic argument as far as copper is concerned; and since the metal is suffering from a shortage of demand, a little bit of inflation would be good for copper, however bad it might be for the country. But no one could believe that inflation would be let out of hand so that any relief that the metal may find in this way is not likely to last long.

The second cause of uncertainty is the apparent militancy of trade unions at the recent Trades' Union Congress. The resolutions which the Congress passed are not, of course, binding on any single union, and perhaps a little flag-wagging and rabble-rousing will be good for the unions' morale without necessarily being bad for the country's economy. However, if strikes were to break out—as well they might over almost any sector when the demand for a 40-hour week is really pressed—then it might be that the copper-consuming industries would be hard hit. What makes this a special danger is that it is in the engineering group of industries that the 40-hour week claim is going to be pressed most vigorously.

A third source of uncertainty lies in the fact that the country is already in the shadow of the next General Election. As the election approaches, so caution will spread and the readiness to start new developments or commit resources will be less. All these factors will tend towards a less buoyant industrial atmosphere.

Finally, there is the uncertainty created by the existing European currency relationships. The present situation is one that can hardly continue. If Germany persists in her refusal to revalue the DM., it is hard to see that Britain can simply accept the refusal and see her gold reserves dwindle away as fast as ever. What the outcome will be is unknown. But the uncertainty is there, and it is uncertainty which is the greatest enemy of a copper revival.

The psychological factors on this side of the Atlantic are difficult to estimate. It ought to be clear to anyone that copper at its present price is a good buy. It cannot fall much further, and when the revival does come, it is sure to carry the price well above the

present figure. On the other hand, consumers have got the bit between their teeth as never before, and it will be noted that the discussions on marketing Rhodesian copper have made little headway during the present headlong fall. Furthermore, such is the growing pressure on profit margins, particularly in the engineering industry, that firms may well be pressed to hang out for even lower copper quotations in the hope that they will provide some relief from the growing costliness of all other production factors. There have been in copper's headlong fall a number of psychological barriers through which the price has passed only after some hesitation. There would appear to be another barrier around £175 and it is on the cards, perhaps, that this may prove the impenetrable one.

Across the Atlantic it is possible to say almost the same thing, using slightly different terminology. There is one factor which is more obvious in the United States than in Britain, and that is the threat of deflation. The falling-off in demand for capital equipment, the changes in defence plans, the slide on Wall Street, are all suggestive of hesitancy in the American economy.

However, the really worrying aspect of the copper scene in the United States is the current pressure to revise tariffs.

There is nothing remarkable in the fact that, with copper in its present slump, there should be talk of higher tariffs. What would, however, be unfortunate, is a decision to draw up a long-term policy for copper in the present depressed circumstances. It is never sound economics to settle the commercial affairs of such a large industry when it is in a pronounced state of either boom or slump. Undoubtedly, however, American copper producers can see in the present situation an opportunity to obtain that degree of protection which they would not have dared to ask for as little as a year ago.

One of the surprising features of this present slide in prices has been the slowness of American producers to cut back their output. Some cuts were made, and these early on when copper was as high as 36 c. But the total cuts which have been made even now are an insignificant proportion of the total potential output. It is not suggested that the American producers, leaning back on their handsome profits of the last decade, have taken the calculated risk of allowing the market to flop in order to obtain a degree of protection which they could not have won in normal circumstances. Nevertheless, their production policies over the past few months have been difficult to follow. The prospects of a revival of copper consumption have never appeared obvious and it is surprising that the producers have waited so long before cutting deeply into their present rates of output.

How much further will copper go? At the end it is not any easier to answer, but it is possible, perhaps, to suggest where the answer lies. It is to the producers, rather than to the consumers that we must go for it.

NATIONALIZING INDIAN MINERALS

The Rashtriya Manganese Khadan Prantik Kamgar Sangh, which is affiliated to the Indian National Trade Union Congress, has demanded the immediate nationalization of the Indian manganese ore industry in the States of Bombay and Madhya Pradesh.

Our correspondent in India reports that in a memorandum addressed to the Government of India, the Kamgar Sangh has referred to some foreign companies in the two states.

"A general impression of the whole manganese labour community of Nagpur District is that the mine labourers have not yet derived any benefit from the Indian freedom", says the memorandum. It adds that "The labour class of this province is still under British serfdom".

The general question of reserving certain minerals in Madras State for State exploitation, including the magnesite deposits in Salem district, is under the consideration of the Madras Government. Replying to a question in the Madras Legislative Assembly, Mr. R. Venkataraman, Minister of Industries, said that in the Salem district an area of 157,334 acres containing magnesite deposits had been leased to the Salem Magnesite Syndicate, Ltd.

The lease will expire on January 10, 1959. The question as to what should be done in respect of the mines would be considered in the light of the decision of the Government on the general question of State exploitation of the minerals. The Minister said that the Syndicate wanted the lease to be transferred to Burn and Co., but the Government did not agree to such a transfer. Burn and Co. had proposed to buy the rights for £100,000.

In Madras, only two important minerals can be exploited by the government, namely bauxite and magnesite. The State Government has, therefore, suggested to the Government of India that the exploitation of the minerals should be done by the government in the public sector. It has also been announced that Burn and Co. had offered to the Government of India that they would set up a big industrial plant involving a capital of Rs.20,000,000 at Salem for the exploitation of the magnesite deposits.

IN SEARCH OF PROSPECTIVE PROSPECTORS

The U.K. Atomic Energy Authority has announced its readiness to buy annually from existing or future mines in Kenya, Uganda, Tanganyika, Swaziland and British Guiana supplies of chemical concentrates containing up to 500 s.tons of uranium oxide. Contracts will cover a 10-year period from the coming into production of a mine, providing that the end date of the period does not extend beyond 1972.

The Authority will offer prices which are reasonable in the light of world conditions at the time, having regard to the principles on which prices for uranium have been negotiated elsewhere. It reserves the right at any time to bring other British colonial and dependent territories within the scope of this plan.

In line with this policy of encouraging the search for uranium in Commonwealth territories, prospectors have been advised to investigate strong radioactivity which has been noted in north-western areas of Southern Rhodesia. There is also a demand for prospectors in the Northern Cape, for the Rhodesia Railways are looking for a group of companies that will prospect for and mine all minerals in the Vryburg and Kuruman areas.

The total area is about 6,600 sq. miles of land, and among the list of possible minerals there are gold, diamonds, iron ore, lead and zinc, and chrysotile asbestos, manganese, Cape Blue asbestos and limestone are definitely present. A notice inviting applications from consortiums, groups of companies, or companies, says that the successful applicant will be given exclusive rights to prospect and mine all minerals in the area. On an average, a total of £100,000 a year will have to be spent in prospecting the entire area for a period of five years.

"In view of the magnitude of the area concerned and the variety of minerals believed to be present, only those companies with the necessary resources will be considered," says the notice.

The Rhodesia Railways hold the mineral rights in this

area through an old agreement signed by Cecil John Rhodes and the Cape Colony Government in 1890. Part of this agreement states that Mr. Rhodes "binds himself to proceed with the railway extension from Vryburg to Mafeking provided the Cape Government purchases the Kimberley to Vryburg section on the foregoing terms, and he receives a further grant of 6,000 square miles of Bechuanaland". Over the past 60 years the rights passed eventually to the Rhodesia Railways. The original manuscript of the agreement, bearing Rhodes' signature, is at Railway headquarters in Bulawayo.

A royalty to be approved by the Railways Board will have to be paid to the Rhodesia Railways who will also retain the right to participate in up to 10 per cent of the issued share capital of any company floated to extract the minerals. The notice states: "It must be clearly understood that any rights granted by the company will be subject to the laws governing prospecting and mining in the Union of South Africa and to any conditions embodied in the certificates of mineral rights and title deeds in respect of the land".

The right to mine asbestos on seven farms in the area has already been granted to the Cape Blue Asbestos Mine (Pty.) Ltd., but the company which is granted the concession by the Rhodesia Railways will have the right to search for, and mine, any other minerals on these farms provided they do not interfere with existing mining rights.

EGYPTIAN MINING PROJECTS

In view of the frustrations experienced in the past by companies interested in the exploitation of Egypt's oil and mineral resources, there is perhaps some cause to suspect that current statements regarding Egyptian mining projects may err on the side of over-optimism, and it is with this reservation that we transmit the latest information from Cairo.

Geological missions at work in the Sharm el-Sheik area in the south of the Sinai peninsula, it is stated, estimate that it will be possible to produce annually 100,000 tons of manganese ore in that area. The Ministry of Industry has already decided to set up a company with a capital of £E500,000 for the exploitation of the deposits.

According to an official of the Ministry of Industry, the implementation of a number of mining programmes which have been proposed would add almost £E4,000,000 to the national income. These projects include—in addition to the Sinai manganese scheme—plans for the exploitation of iron ore, phosphates, salt, zinc, lead, tin, black sands, ilmenite, chromite, graphite and other mineral deposits.

The most recent discoveries include zinc and lead finds at Om Gheig. Egypt's imports of these two minerals are estimated at £E250,000 annually. The total value last year of mineral ores produced by Egypt was £E1,538,000.

The Ministry of Industry has allocated £E12,530,000 for mineral prospecting during the next five years.

Last month it was reported that Egypt was to form a new concern named General Oil Co., which would be supervised by the State Economic Organization, and that this company would have prospecting rights in 61 areas in the eastern desert, Sinai and the Red Sea zone. Prospecting licences for these areas had been sought for several years by Anglo-Egyptian Oilfields and Mobil Oil.

In view of the benefits which the exploitation of mineral resources could bring to the people of Egypt, if harnessed to the raising of their very low living standards, the government's efforts to foster mining expansion will not be unsympathetically regarded in Western countries, provided that the methods adopted are on more equitable and realistic lines than the treatment accorded to foreign companies in recent years.

U.S. MINING INDUSTRY IS WARNED

The U.S. Department of the Interior has warned the mining industry that the day of the emergency-inspired Government Assistance Programme is ending and that "an adjustment of supply to normal industrial demand is now necessary" states a report from the Metal Mining and Industrial Minerals Convention of the American Mining Congress.

Speaking for the Secretary of the Interior, Mr. Fred A. Seaton, special assistant Mr. John G. Liebert also told the meeting that "foreign mining industries should expect to share equitably in this readjustment, just as they shared in the higher profits during peak production".

Mr. Liebert said the government would continue to help improve U.S. metals mining, through mining research and a limited amount of financial assistance to find new metals reserves. But he said that the government's metal requirements for defence "have been met substantially" and that "except for a few commodities" stockpile goals have been achieved.

The Administration's backing of tariff relief for lead and zinc, he added, is a "recognition by the government that the welfare of the nation may be advanced by providing interim assistance from time to time to the mineral industries to enable them to achieve or regain a competitive status in world trade".

BRITISH PRODUCT WINS AMERICAN AWARD

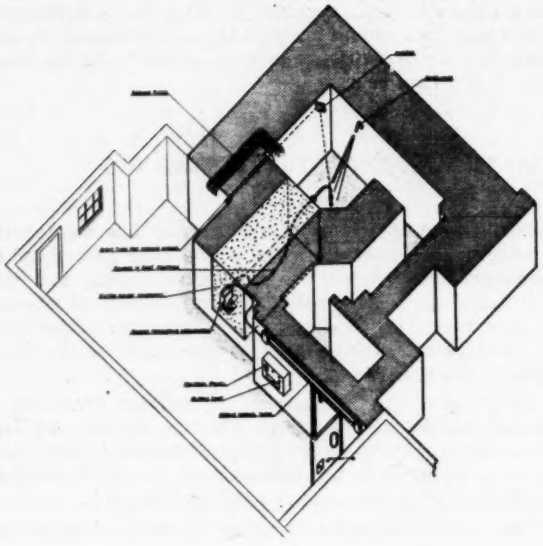
In competition with 200 other items of mining equipment, a British-made product has been selected by a panel of leading American industrialists as the outstanding contribution of 1957 towards the technological advancement of the mining industry.

The product is the Radicon worm gear unit, designed and built by David Brown Industries Ltd., of Huddersfield, and marketed in America through a subsidiary company in California.

The competition is an annual event organized by one of America's leading technical journals, *Mining World*, and judged by a committee of senior mining executives in San Francisco. "Blue Ribbon" awards are made for the outstanding developments in each of five categories and the British-made gear unit gained one of these awards in the General Equipment class.

In the last two years several hundred Radicon units have been supplied by the David Brown branch in California to American manufacturers of mining equipment. Most of these units are operating in the U.S.A., but many have been trans-shipped to Korea, the Philippines and other Far East markets. Contributory factors taken into account by the judges in making their "Blue Ribbon" award was the trouble-free service given by the British-made units and the quick delivery and after-sales service provided.

This outstanding achievement is particularly encouraging, coming as it does at a time when the attention of British manufacturers of mining equipment is being increasingly directed to the highly competitive dollar markets.



Opposite is shown the radioactive source shield with roof removed, while below is a graph revealing the effect of irradiation on a conventional lubricant

Lubricants for Nuclear Power Stations

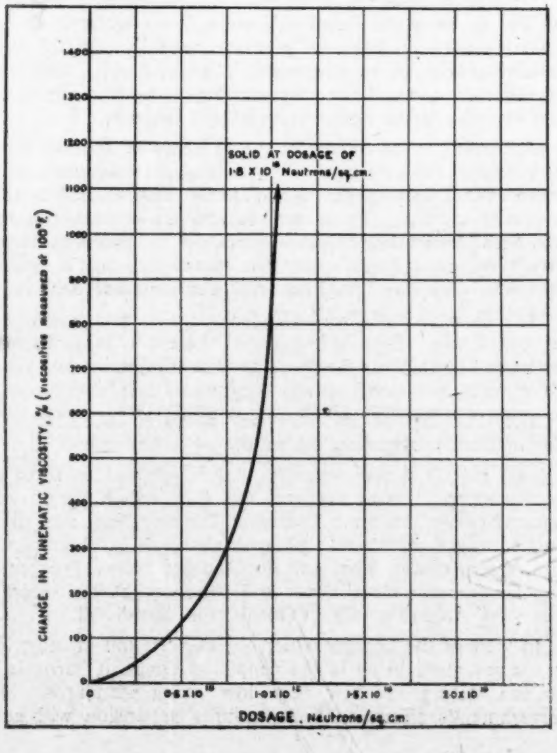
Special petroleum products developed by Shell will be used in the operation of the first of the Central Electricity Authority atomic power stations at Bradwell, Essex, which is being built by the Nuclear Power Plant Co. When initial schemes for atomic power stations were being considered several years ago it was realized that among the important problems to be tackled would be the lubrication of plant subject to radiation. A range of radiation-resistant lubricating and hydraulic oils and greases have been developed under the brand name Shell A.P.L. to meet the current and future requirements of nuclear power stations.

IT was realized at the outset of the Calder Hall project that the lubrication of the equipment of a nuclear power station would involve problems not previously encountered, and lubricants would be required having special properties such as resistance to atomic radiations. In February, 1953, a programme was therefore started at Shell's Thornton Research Centre, in collaboration with the Atomic Energy Research Establishment at Harwell, on the effect of atomic radiations on various lubricants.

A few months later Shell was consulted by C. A. Parsons Ltd., who were building the gas circulating plant for Calder Hall. The special lubricant which it was necessary to develop for this plant is being supplied to Calder A and B stations.

Since this programme of research was started four years ago a radiation laboratory has been built at Thornton where a Cobalt 60 source providing intense gamma radiation has been installed. The Cobalt 60 is in the form of pellets, six of which are sealed in an aluminium capsule contained in a stainless-steel cylinder 3 in. long and ½ in. dia. with walls 0.032 in. thick. This cylinder is attached to a flexible steel cable, which moves the source within a 1 in. dia. stainless-steel tube. Since a few minutes' exposure to the gamma radiation from the source would be fatal, it is necessary to provide concrete shielding round it with a minimum thickness of about 5 ft.

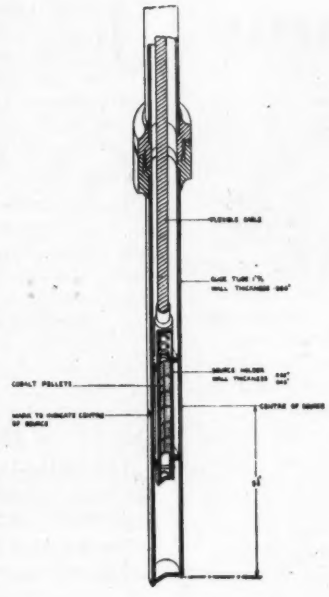
This shielding is constructed of concrete blocks which were staggered during the building so that there is no direct path for the radiation to escape to the outside along the joints. When experiments are in progress the source is in the exposed position at the end of the tube in the cell. Before the cell can be entered the source must be withdrawn up the tube until it lies within the loop in a specially dense


SOLID AT DOSAGE OF
1·8 X 10 Neutrons/sq.cm.
CHANGE IN KINEMATIC VISCOSITY, % (viscosities measured at 100°F)
DOSAGE . Neutrons/sq.cm.

mass of concrete. The system is equipped with an elaborate safety interlock system whereby the key which unlocks the door of the radiation cell is also that which unlocks the operating mechanism (located in the control room) for the withdrawal or exposure of the source. When the source is in the exposed position, it is impossible to remove this key from the mechanism operating the source. This can only be done when the source is safely retracted. Similarly it is impossible to take the key from the door to operate the source mechanism unless the door is first securely closed and locked. As a further precaution, however, the operator holds a sensitive Geiger counter in front of him at arm's length as he walks through the labyrinth to make absolutely sure that there is no radioactivity present.

Samples to be irradiated are arranged around the source in specially shaped containers designed to make the maximum use of the radiation available. Gamma rays, unlike neutrons, do not modify the nuclei of atoms they encounter, so that no radioactivity is induced within the cell. It is therefore perfectly safe to enter the cell and examine the samples once the source has been withdrawn within the dense concrete block. The samples may be viewed during irradiation by an optical arrangement involving a mirror and spotlight. All the usual services—water, electricity, gas, compressed air and vacuum, are provided in the cell so that various experiments can be carried out under the influence of gamma radiation.

The Cobalt 60 source emits gamma rays only, but some mechanisms of a nuclear power plant will be exposed to neutrons as well as to gamma rays. In the experiments done in collaboration with Harwell the samples were inserted into a nuclear reactor where they were subjected for various periods to a neutron flux of about 10^{12} thermal neutrons/cm²/sec. together with the associated fast neutrons and gamma radiation.



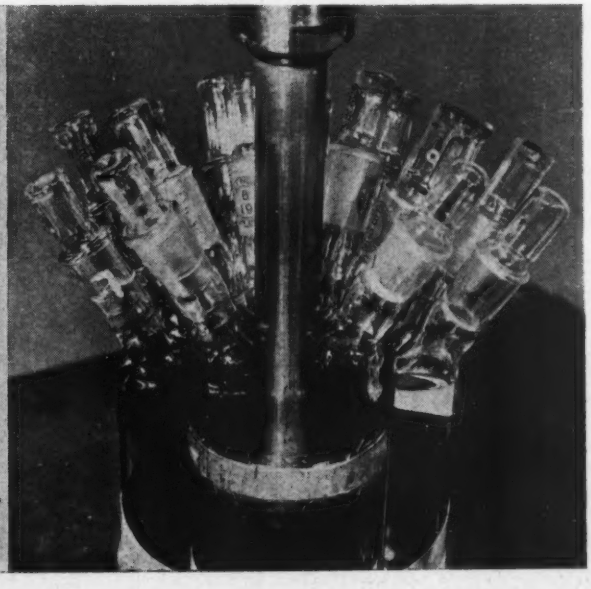
Under the influence of radiation, molecules can absorb large amounts of energy. As a result the molecules become excited and, depending upon their structure, can break down into highly reactive fragments. These fragments can then combine with neighbouring molecules to form compounds of higher molecular weight, as evidenced by significant increases in viscosity of the irradiated material. At the same time these changes are accompanied by the evolution of gases such as hydrogen and methane.

A very large number of materials, including a variety of synthetic as well as petroleum lubricants, have now been exposed to various dosages both of gamma radiation and neutrons.

An examination of the samples after irradiation showed that many had undergone profound changes in molecular structure and physical properties. For example, certain conventional petroleum lubricants rapidly darkened in colour and increased in viscosity with increasing dosage of irradiation. They eventually became transformed into jelly-like masses with melting points in excess of 220 deg. C. and largely insoluble in petroleum spirit, cyclo-hexane, benzene, acetone ethanol and ether. Similar effects were observed with some synthetic diesters and silicones. Research work at Thornton has been planned to obtain information on the influence of molecular constitution of stability towards atomic radiations and already lubricants have been developed which show practically no change in physical properties at radiation dosages which transform many lubricants into solids.

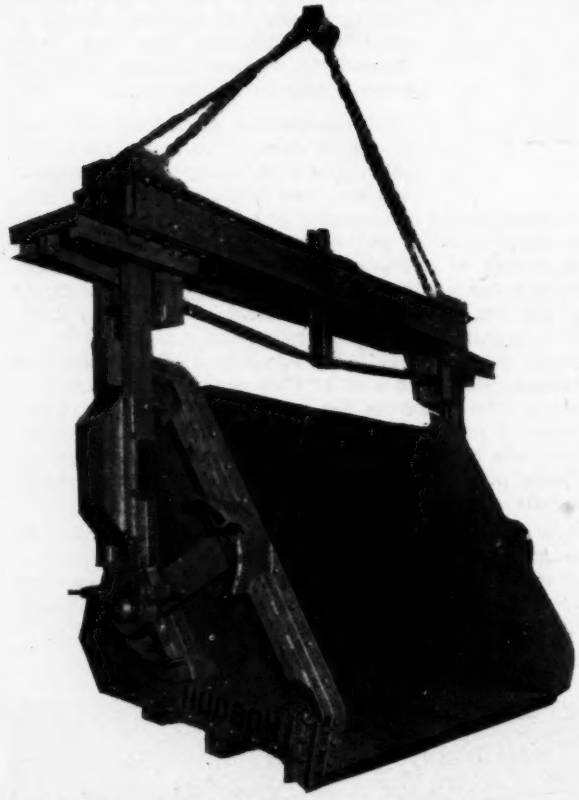
As a result of research work in which the Cobalt 60 source has played its part Shell have developed a number of special lubricants which are resistant to radiation and which meet the requirements of the nuclear power stations now being built for the C.E.A.

Above: A sectioned view of radioactive Cobalt 60 source in operating position is shown. Below left is the radiation laboratory under construction, the staggered blocks being noticeable. Below right are tubes arranged around the source



Placing Stone in Ghana

THE breakwater and harbour works, now under construction at Tema, Ghana, involves the quarrying, crushing and placing of some 10,000,000 tons of tough, close-grained granite. The quarry is worked by a combination of heading blasts and low benches. Transport from the quarry to the site is by a 3 ft. 6 in. gauge railway, and trains are hauled by 750 h.p. diesel electric locomotives, three sizes of wagon being used for transporting the quarried rock. Block stone is transported in Hudson 300 cu. ft. capacity automatic tip wagons.



The lifting brace incorporating C.P. 9 in. dia. rams

Amongst the specific features of the Hudson 300 cu. ft. wagons are the heavy-duty Timken taper roller bearings fitted to deal with the transportation of heavy, uneven loads at running speeds of between 25 and 30 m.p.h.

A Lima crane, mounted on crawler tracks and fitted with a 100 ft. boom, is used to operate a specially designed lifting beam from which are suspended two arms or braces. These arms are used to couple the lifting beam to the trunnions of the tipping motion of the Hudson trucks.

With the incorporation of C.P. 9 in. dia. rams in the lifting beam, the beam is lowered to a truck with the suspended arms extended slightly to clear the trunnion ends. Air is supplied to the rams which are thus actuated and the brace arms are brought in securely over the trunnions. The truck body is hoisted from its underframe and the load is swung out over the breakwater, correctly positioned and dumped.

Soviet Tunnelling Machines

THE total volume of development work in Soviet collieries is considerable, being on the average more than 83.7 ft. per 1,000 tons of output. Some 17½ per cent of all underground workers are engaged on development. Taking the Soviet coalmining industry as a whole, 4,395 miles of development roads were driven in 1955—mainly gate roads, airways, crosscuts, and crossholings, etc.

In the Soviet Union, headings in coal are driven mainly by the conventional method of drilling, blasting and loading, but an increasing number of installations are employing tunnelling machines. In 1955, the use of tunnelling machines had increased by 60 per cent compared with 1954, and comprised about 10 per cent of all development work. In mixed coal and rock headings conventional methods are mainly employed, but tunnelling machines are also finding an application. For heading in rock which is soft or of medium hardness (up to 4—5 on the Protodyakonov scale) ShBM-1 and PKG-2 tunnelling machines are mainly used.

The ShBM-1u tunnelling machine completely mechanizes cutting and loading operations in level development roadways in coal or soft rock.

The working element—a circular head fitted with three radial cutting arms disposed at 120 deg. around a central boss—is rotated to cut out an initially circular roadway 9.8 to 13.1 ft. in diameter. Bits fixed in the arms are inclined at various angles to cut concentric grooves about 1¼ in. wide and 10 to 12 in. deep in the face, and breaking cones are introduced into the grooves as the machine advances to burst off the 4¼-in. pillars of strata so formed. The bits are tapered and require no set-screws to hold them in position: this design also facilitates pick changing, since the bits can be quickly hammered out with a suitable drift.

The broken material fills the space between the face and the protective shield and is picked up by buckets at the extremities of the arms. It is carried around until fed through a port in the upper section, from which it discharges on to a built-in 24 in. conveyor for subsequent delivery to the outbye haulage.

Two picked drums, located behind the head and one on either side of it, trim the sides of the roadway to enable straight-legged arches to be set. By a system of hydraulic jacks the machine advances with a walking action in increments of 2.3 ft.

The head of the unit is supported on a single central shoe, located behind the cutting head. By means of a ram (connected to the hydraulic system by hand-operated valves), the front of the machine can be raised or lowered in relation to the shoe and thus permits steering in the vertical

plane. The rear support comprises the support shoes and hydraulically operated gear which allows the machine to be moved from side to side—permitting steering in the horizontal plane.

The walking action is obtained by means of a thrust mechanism similar in principle to that employed with the Samson Stripper. Two rams situated at right angles to the axis of the machine thrust against the sides of the roadway. These serve to prevent the body of the machine rotating during cutting and provide an anchorage for the action of the advancing rams, which come into play to move the machine forward.

As a result of trials with the ShBM-1u the Sh2M-1 model has been developed, incorporating certain improvements. The main motor has been increased to 75 kW, and the number of picks increased and the size of kerf widened to allow easier fracture by the breaking cones; this has also reduced the lump size of the debris and facilitated handling. The deflectors and buckets in the later model are cast integral with the cutting arms to increase their strength. Dust suppression measures have been improved also—the water now being admitted to the face through a vent in the hub and one of the cutting arms; in addition, a dust suction apparatus has been added.

In the later model the vertical side cutters have been replaced by horizontal ones and the individual motors and reduction gears have been removed. The drums are now driven through a special clutch from the main reducing gear. Each drum cutter on the new model is provided with six arms and 37 picks which effectively comminute the rock for removal by spiral gummers. The new cutters, in addition to trimming the sides of the roadway, provide a lodgment for the feet of the arch supports. A third cutter has been added which digs a drain channel (12 x 8 in. cross section) on either side of the roadway, as required; this, however, cannot be used while the main cutting head is operating.

The ShBM-1u had a conveyor belt 20-in. wide operating at 255 ft./min. to give a capacity of 90 tons/h. The width has now been increased to 23.6 in. in the ShBM-1 model, and its method of attachment to the machine improved. The belt is now suspended from a temporary mono-rail and its height can be regulated.

The following figures for energy consumption are stated to have been obtained:

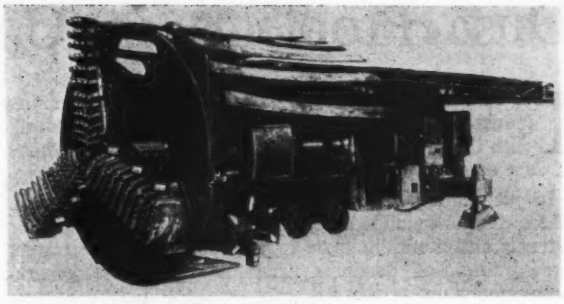
In coal of hardness $f = 1.5$	0.38—0.55 kWh/cu. yd.
" " " " $f = 2$	0.43—0.67 kWh/cu. yd.
" " " " $f = 4.5$	Up to 3.8 kWh/cu. yd.

Seventeen of the new models were at work in 1955 and accounted for 4,103 yd. of drivage. The maximum advance was obtained in a clay shale at a colliery in the Donbass, where the rate of advance was 297 yd. per month.

The PKG-2 Machine

The PKG-2 tunnelling machine (which is still in the experimental stage) was designed for operating in coal and soft rock, but trials have been carried out with modified units in harder strata. Although intended for working in seams of moderate gradient, the PKG-2 can operate on inclinations up to 30 deg., producing a roadway of 7.5 ft. diameter and cut away at the sides to take arch supports.

A large rotating head revolving at 6 rev./min. provides the cutting action through the medium of a central cutter and two sets of picked discs. Each set of discs rotates on an axis at right angles to the line of the roadway and both turn with the head as it revolves. The cutting bits thus describe a hypocycloid in space, each bit periodically coming into contact with the face of the roadway, taking off a small strip as it engages the strata. The centre cutter, 25.6 in. in diameter, breaks up 12 per cent of the area of the face, cutting four concentric grooves (up to 1½ in. wide and up to 5 in. deep), and the strata left between the grooves are broken down by the wedge-shape flanges of the pick boxes. The two banks of discs, of 17.3—25.6 in. diameter, also cut concentric grooves (up to 1.34 in. wide and 2.95—4.72 in. deep) in the remainder of the face and break down the strata remaining between the grooves by the wedge-shaped pick boxes.



The ShBM-1u tunnelling machine

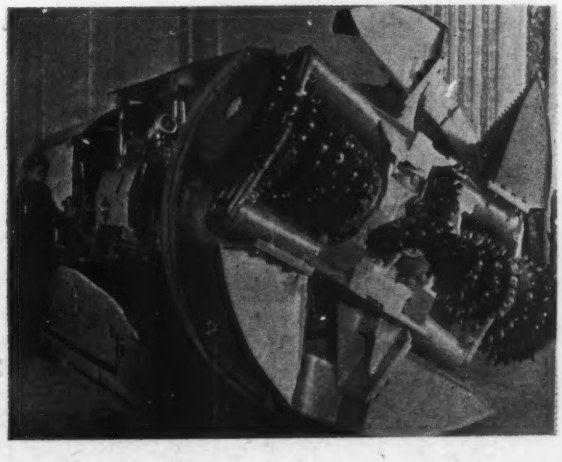
Gathering Broken Rock

The broken rock is gathered by four buckets, disposed around the periphery of the cutting head, and discharged into a hopper behind the head. This feeds on to a conveyor via a short intermediate belt. Caterpillar tracks—two on the floor and one on the roof—provide the means for advancing the machine, ensuring its stability and the required thrust for operating in inclined roadways.

The PKG-2 was initially designed for operating in slightly inclined seams 8.2 ft. thick, with a stable roof permitting an unsupported face area of about 151 sq. ft. In such conditions (where the coefficient of strata hardness does not exceed 0.8192 lb./sq. ft.), the power required by the motor seldom exceeds 40—50 kW.

This article has been condensed from a report by the Technical Mission of the National Coal Board on the coal industry of the Soviet Union.

The PKG-2 tunnelling machine



Dust Problems in Open Pit and Underground Mines

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The article herewith is condensed from a paper by Mr. M. L. Roberts at the eighth conference of the McIntyre Research Foundation held in Canada last year. The author is industrial hygiene engineer at Saranac Laboratory, New York.

INDUSTRIAL hygiene programmes in the metal mining industry have in the past years been concerned mainly with the problems of dust exposure and with methods of dust control.

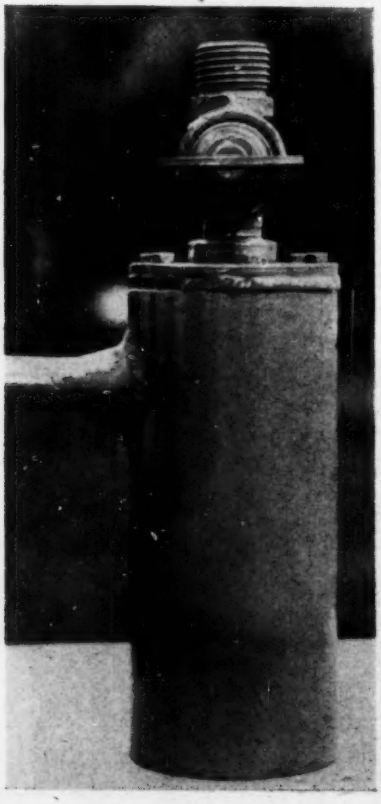
In pit mining, operations are carried on in the open where dust is readily dispersed and diluted by natural air currents and therefore there is no problem, such as occurs underground, of dustiness accumulating in the general environment unless the pit becomes exceedingly deep and confined. However, in open pit work, there are operations which can produce large amounts of air-borne dust in local areas and men working in such an area can be exposed to harmful concentrations of dust.

In open pit work, blast hole drilling may be done by churn drills, percussion air drills, or rotary drills, or by the flame jet piercer. Since churn drilling is done with water to remove the cuttings as a sludge, there is no dust problem involved. Air drills are sometimes used in drilling primary blast holes, but are most often employed as a hand-held machine in drilling boulders for secondary blasting. Wet drilling will provide good control of dust at this operation. The use of self-contained units which have an air compressor, water tank and drill equipment mounted on a truck or tractor chassis is an ideal set-up for this type of jack-hammer drilling. However, where severe winter conditions prevent the use of water in this manner, drilling is very often performed dry, apparently with the futile hope that the wind will always blow away the drill dust from the breathing zone of the operator. Personal respirators can be used. Various types of dust traps can be used at the collar of the hole and the dust diverted away from the operator.

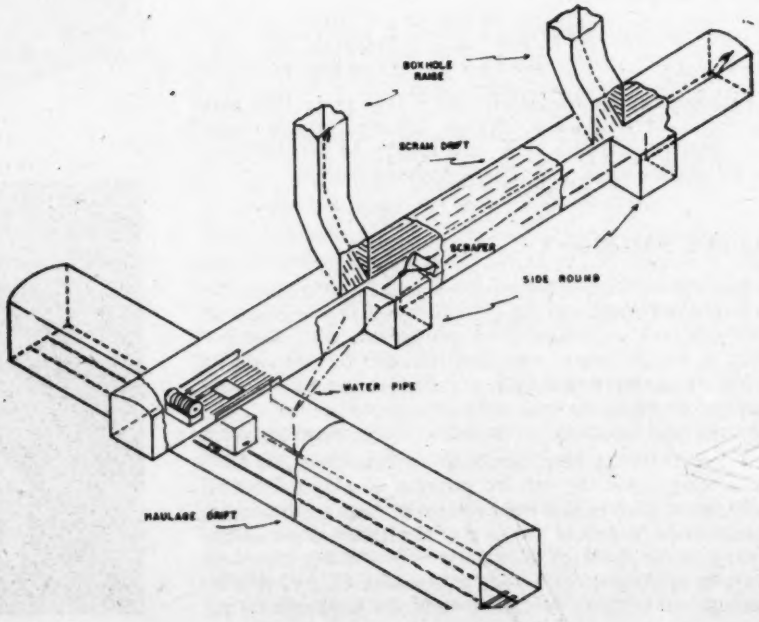
The recent introduction of boom-mounted jack-hammer drills on small self-propelled vehicles for secondary drilling has been beneficial to this dust problem, as the operator does not have to drill down-holes and can stand more in the clear of the work as compared to the hand-held drill.

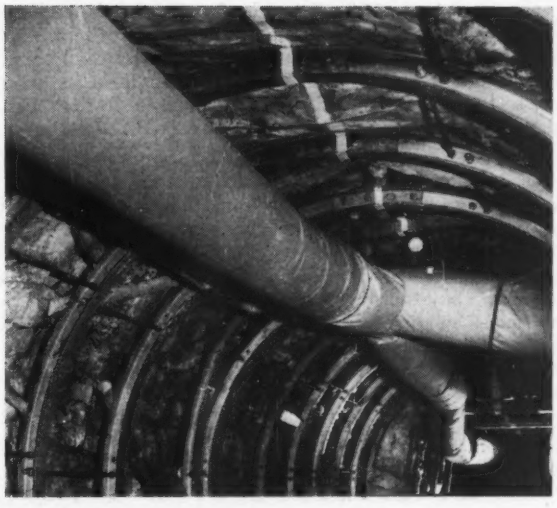
The use of the drop ball for breaking boulders produces but little dust and the operator is some distance from the dust zone.

The rotary drill was introduced into open-pit operation about five years ago. For disposal of the cuttings and dust a shaped hood was installed at the collar of the hole and exhausted by a centrifugal fan. Efficiency of this two-stage collector is satisfactory, but the dust load exceeds its capacity and erosion rapidly destroys the fans, with the result



Opposite is the quarry version of the Consolidated Pneumatic Hemborn dust extractor, developed with quarry work in view. The equipment consists of an extractor which exhausts the dust to air at a convenient distance. Below is a diagram of an ore transfer scram with water sprays for dust control





A Y-section of Pluvicor flexible ducting, in an underground installation

that the drills are often operated with all or part of the collecting equipment removed. The dust is then exhausted overhead through a short stack.

At some operations the rotary drill has been modified by the introduction of a water jet into the flushing air stream, and cuttings are ejected as a thick sludge. This modification can eliminate the dust, but control of water volume is a problem.

Jet piercer drilling of hard rock has been developed and is largely used in the very hard iron ores where churn drilling or air drilling is inefficient. The hole is made by the spalling action from rapid heating of the rock by a jet flame produced by a mixture of fuel oil and oxygen. Water introduced at the bottom of the hole through the drill stem is vaporized and the cuttings are ejected from the hole as a fine sludge. There is no dust problem associated with the use of the jet drill. There is, however, several per cent of carbon monoxide in the exhaust gases along with other products of combustion of the fuel oil. A canopy-type hood over the hole, connected to a fan and duct system, has been provided on the machine to collect the gases and exhaust them in the rear. The design of this hood and fan system is evidently not adequate to handle the volume of gases evolved, because a considerable portion escapes in a visible cloud around the front end of the machine.

There is no particular problem from blasting in open-pit work.

Loading of broken ore or rock on to rail cars or trucks is done by power shovels. The use of a heavy water spray at the shovel pit is the best means of suppressing this dust. Personal respirators can be used to good advantage in situations where dust exposure is intermittent.

With truck haulage, the driver may be exposed to appreciable amounts of dust during the shovel-loading operation and during the road haul. The use of water at the shovel operation and on the haul road is the most favourable method of dust control available. Filtered air supply systems may be built into the truck cab.

Dust Underground

In underground mines, all of the operations which are performed can create dust or other air contaminants in some degree.

There are three tools available for dust control, namely water to prevent formation of dust and to remove dust from the air, ventilation as a means of diluting dust concentration and of preventing its accumulating by transporting it from the mine, and local dust collection by mechanical or electrostatic separation.

Underground operations are confined, and ventilation air often courses through many successive work areas so that the migration and accumulation of contaminants is significant. It is sometimes found that the high dust concentration recorded at one location actually originated at another operation some distance away and was carried downstream with ventilation air currents.

Water curtains in drifts and connecting raises are of some benefit in removing air-borne dust from ventilation air. However, measurements of dust concentrations by the author of both sides of a water curtain created by ordinary fine spray nozzles showed a reduction of only 20 per cent in the dust count. A very fine spray of fog induced by the addition of air pressure in the water line near the nozzles will increase the efficiency. Excess fog can, however, make a safety hazard in a main haulage way or manway. The limited benefit obtained with water curtains again emphasizes the fact that dust is best controlled at its source.

The direction of ventilation air at a scraper or other operation may be such that the dust raised is carried away from the operator and he is therefore indifferent to the amount of dust which is created. Education of the miners and foreman to make them dust conscious is necessary.

Drilling Hard Rock

In underground hard rock mines, drilling may be done by rotary diamond drills or by compressed-air powered percussion drills. There is no dust problem from operation of the diamond drill, but large amounts of fine dust are created by the operation of the percussion drill. The method of dust control generally used is wet drilling. Efficiency is high, but some dust does escape.

Various dry-type dust collectors have been designed for air-drilling operations. Several of these have been approved for rock bolt hole drilling in coal mines by the United States Bureau of Mines. In dry collectors, dust is trapped either by a suction hood at the collar of the hole, or the dust is exhausted through the centre hole in the steel. In either case, the dust is filtered out and air released locally.

A comparison of hooded dry drilling and wet drilling has revealed that equally effective dust control can be attained with the dry drill. However, high rates of air exhaust for the hood are necessary, up to 80 cu. ft. per minute for the dry system of dust collection, to be as effective as wet drilling. This exhaust is provided by an air ejector or auxiliary pump. Because some dust escapes in either wet or dry drilling, ventilation of the drill site is of major importance.

Blasting is a source of heavy concentrations of dust. Primary blasting in headings and stopes should be done at the end of the work shift and enough time allowed between shifts for the contaminants to be cleared from the mine by ventilation air. Only where the ventilation scheme allows the clearing of contaminants directly into the upcast air without coursing through other active work areas should large blasts be permitted during the work shift. Sufficient ventilation air and the liberal use of water to wet down the blast area before and during the blast can keep the average dust concentration within permissible limits.

The trend in mining practice is always towards methods wherein a large tonnage per man-shift can be realized. This trend has resulted in the greater employment of mechanical loaders and of sub-level methods where scrapers are used in a scram drift for transfer of ore from stope to cars. This particular mining method has several sources of dustiness.

Since the ore is drilled and blasted in large blocks, it is often dry and dusty as it is pulled from the mining sub-level through the box raise into the scram. Scraping of the ore through the scram—which may be quite long—loading the cars and secondary blasting of over-size material are all sources of dust. Good ventilation through the scram is necessary, but thorough wetting of the material through the entire length of the scram is even more essential to prevent dustiness. Scraper cable action and blasting may make the maintenance of water pipe in the scram difficult and it is sometimes even more difficult to convince the scraper operator that he should drag a water hose back into the scram to wet down.

In the haulage drift with a scram driven above and at right angles to it, as illustrated, broken ore comes down the box raise and is moved by the scraper and double drum hoist through the scram to the car in the haulage drift. A water spray is generally used at the scraper platform to wet the ore as it is loaded into the cars. Also shown is a scheme which has proved to be effective in getting water back into the scram and in keeping the area at the box hole wet down. At intervals, side-rounds have been cut into the scram on the side opposite the raises. With a long hole machine, holes are drilled from the drift into the overbreak and between overbreaks along the scram. Water pipes are installed through these holes.

Aluminium Production in Taiwan

The following article, condensed from the U.S. Bureau of Mines publication "Mineral Trade Notes" Vol. 44 No. 3, presents a brief summary of the current modernization of the aluminium industry in "Free China".

THE aluminium industry of Free China is represented by the Taiwan Aluminum Corp., formerly the Taiwan branch of the Nippon Aluminum Co. of Tokyo, Japan, which operated the Kaohsiung and Hualien aluminium plants on the island.

The Kaohsiung plant was erected in 1935 to refine bauxite ore from Indonesia into alumina by the standard Bayer process and to electrolyze alumina subsequently into aluminium metal in Soederberg-type reduction pots. The installed production capacity was 42,000 tonnes of alumina and 15,000 tons of aluminium ingot per year. Peak annual production attained under Japanese management was 31,000 tonnes of alumina and 12,000 tons of ingot. During World War II, the plant was damaged heavily, with 44 per cent of the factory buildings and 28 per cent of the machinery and equipment destroyed.

The Hualien plant, built in 1939, had only one Soederberg reduction plant with an annual capacity of 11,000 tons. Actual output, however, never exceeded 3,200 tons of ingot per year. During the war the plant was damaged beyond repair and had to be abandoned. The plant is now being converted into a nitrochalk fertilizer factory.

Plant Rehabilitation

Since World War II, rehabilitation work was carried out in the Kaohsiung plant using material and equipment salvageable from the Hualien plant as replacement parts. One potline, with an annual capacity of 8,000 tonnes of aluminium ingot, and two alumina units, each with an annual capacity of 16,000 tonnes of alumina, have been restored to working condition. The management of the corporation recognized that in order to facilitate marketing and to increase product value, the Kaohsiung plant must not limit output to ingot aluminium, but should attempt to produce aluminium products such as sheets and plates, extruded shapes, foils, aluminium buildings, tanks, utensils, and the like.

During the past six years the following fabrication facilities were added to the existing smelting plant:

A rolling-mill plant equipped with one hot mill, two strip mills, one flat mill, one slabbing mill (still in process of being built), and accessories, with an annual capacity of 6,000 tons of sheets and strips; a foil plant capable of turning out 600 tons of foil per year; an extrusion plant with an annual capacity of 700 tons of sections, pipes, and wires. The ultimate annual capacity of this plant will be 2,000 tons of extruded products.

The Taiwan Aluminum Corp. now markets seven different categories of aluminium products: namely, alumina and alumina hydrate, aluminium ingot, aluminium sheet and plates, extruded aluminium shapes, aluminium buildings, aluminium foils, and finished aluminium products. The export grade of ingot contains 99.5 per cent aluminium and the grade marked for domestic consumption, 99 per cent. Export of aluminium ingots and aluminium products have increased steadily during the past decade.

The corporation is working on a large-scale modernization project designed to reduce production cost of ingot and to utilize fully the available alumina capacity to produce locally aluminium fluoride and cryolite, two essential raw materials in aluminium manufacture, and to process red mud, now a waste product that has created a disposal problem, in order to recover aluminium oxide, caustic soda and iron.

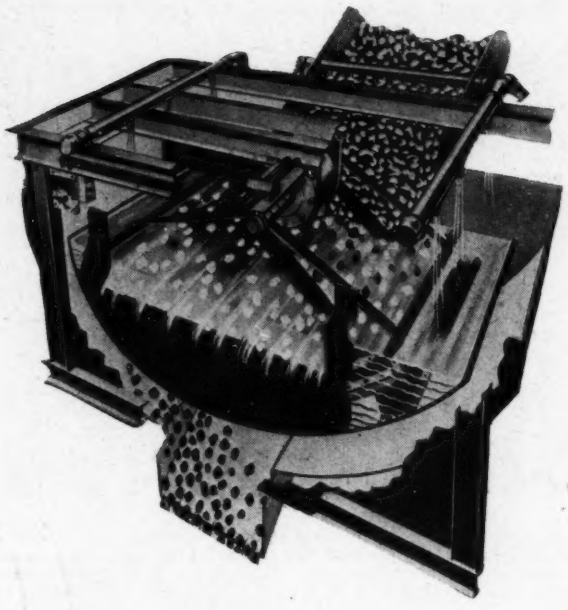
The proposed project, the construction of which is scheduled to begin in 1957, calls for rebuilding the reduction pots into 55,000-ampere capacity by modern design with vertical studs. Thirty-two new pots will be built during the initial stage and connected with the production circuit. The ultimate maximum capacity will be about 20,000 tons per year.

Increasing Fabrication

To match the increased ingot production, an expansion of the fabrication facilities will be necessary. The rolling-mill capacity will be increased to 1,000 tons per month, the foil-mill capacity will be increased to 2,000 tons per year, and annual production in the extrusion plant will be increased by 1,000 to 2,000 tons.

The corporation plans to develop the potential local market for aluminium, simultaneously with the modernization and expansion of its facilities, by encouraging the establishment of private aluminium-fabrication shops.

Machinery and Equipment



U.K. Mining Equipment for Canada

British export producers have been successful in developing a market for mining equipment in the northern and north-western areas of Canada. Several companies are doing so well that they plan to establish Canadian subsidiaries.

Meanwhile, Canadian Prime Minister Mr. Diefenbaker's declaration that he aimed to divert 15 per cent of Canada's import buying from the United States to Britain has brought a timely warning from Mr. Marshall, new United Kingdom Trade Commissioner in Montreal. The Commissioner points out that whatever assistance be given, British exporters will still have to satisfy Canadian buyers as to the price and performance of United Kingdom products.

A PORTABLE DRILLING OUTFIT

The FM-3 portable drilling outfit manufactured by Failing Supply, Ltd., is designed for fast shot-hole drilling. The equipment has a 5 x 6 Duplex power-driven slush pump, a single-stage air compressor and a chain feed pull-down. Rated capacity of shot-hole drilling is up to 5¾ in. dia. and 1,000 ft. depth using 2¾ in. drill pipe.

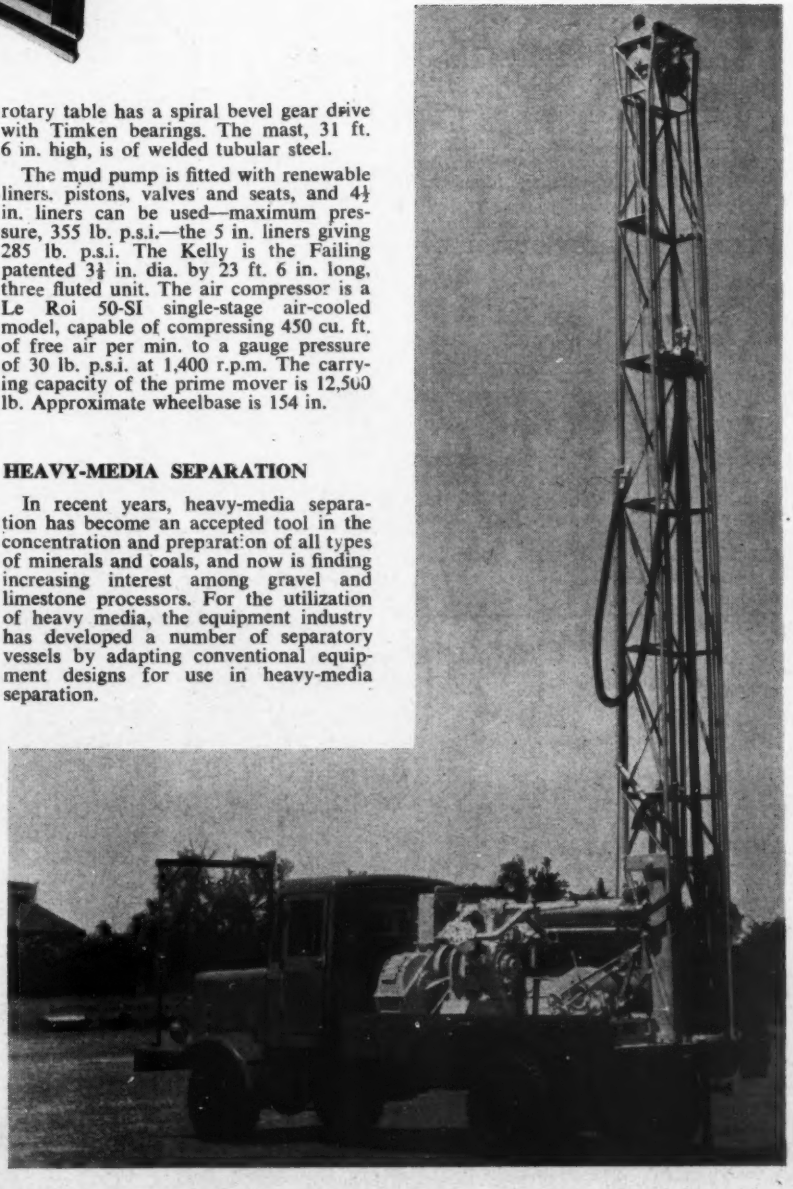
Two 1¼ in. pitch chains operated by an hydraulic motor are responsible for the pull-down action of the machine. The chains run through an equalizing jack-shaft, ensuring even tension on both sides. The chains—on final drive sprockets—run in a vertical line over the table centreline, thus giving a straight pull-down on the Kelly. The use of gearboxes or jaw clutches is eliminated and when pulling up for rod connections, the motor takes no part in the action.

The top sheaves carrying the chain pull-down equipment are spring-mounted. They remain tight and in full engagement with the sprockets throughout the raising and lowering of the mast. The rotary table has a spiral bevel gear drive with Timken bearings. The mast, 31 ft. 6 in. high, is of welded tubular steel.

The mud pump is fitted with renewable liners, pistons, valves and seats, and 4½ in. liners can be used—maximum pressure, 355 lb. p.s.i.—the 5 in. liners giving 285 lb. p.s.i. The Kelly is the Failing patented 3½ in. dia. by 23 ft. 6 in. long, three fluted unit. The air compressor is a Le Roi 50-SI single-stage air-cooled model, capable of compressing 450 cu. ft. of free air per min. to a gauge pressure of 30 lb. p.s.i. at 1,400 r.p.m. The carrying capacity of the prime mover is 12,500 lb. Approximate wheelbase is 154 in.

HEAVY-MEDIA SEPARATION

In recent years, heavy-media separation has become an accepted tool in the concentration and preparation of all types of minerals and coals, and now is finding increasing interest among gravel and limestone processors. For the utilization of heavy media, the equipment industry has developed a number of separatory vessels by adapting conventional equipment designs for use in heavy-media separation.



Above: The Pegson OCC Vessel

Opposite: The Failing FM-3 exploration drill

The use of Schloms link with duraluminium cap

Logically, if material is fed into a vessel filled with a medium in which the lighter particles will float off and the heavier ones sink, all that remains to be done is to remove the sink from the bottom of the vessel with the least disturbance to the separating process.

To meet this sink-removal problem, it has been proved that there is no longer need for complicated, giant-sized machines which operate with high power consumption and which lack the primary requisite for an efficient operating tool, namely accessibility and easy supervision.

The OCC vessel, manufactured by Pegson, Ltd., is designed to meet these requirements.

There are five basic models of the OCC vessel, with a capacity range of up to 400 tons per hr. A considerable number of the equipments are operating throughout the United States and Canada on various ore-separating duties, while the vessel has recently been introduced on the Continent, where two machines are in service, one in Germany on fluorspar and one in Spain on coal.

The OCC Heavy-Media Vessel is new in the United Kingdom, but Pegson, Ltd., has recently been granted exclusive manufacturing rights for the British Isles and Eire. Production arrangements are under way.

LIGHTWEIGHT ROOF SUPPORTS

The German manufacturers, Josef Brand G.m.b.H., Duisburg-Hamborn, have developed a duraluminium cap with the Schloms link for mine roof-support duties. Claimed to weigh only one-third of the weight of steel links and said to possess marked load resistance, the Schloms link can be used for many and varied support duties.

The shape of the Schloms allows for resistance to deformation, while owing to the symmetric design employed, the supports can be used from both sides. The units are supplied in lengths ranging from 36 in. to 50 in. Weights are 31 lb. and 43 lb. respectively.

A test was made with two caps, one arranged in a clamp, as in the pit when supported by a prop, with no possibility of yielding and the other cap attached as a cantilever by the Schloms link. Pressure was applied directly through the steel pin in the distant pinhole. The link gave way at a pressure of 2.2 tons, and it was found on examination that no distortion of the aluminium had taken place. Only the steel plate and the steel wedge were distorted.

FURTHER EXHIBITION HIGHLIGHTS

The Engineering, Marine, Welding and Nuclear Energy Exhibition at Olympia ended yesterday. The following notes relate to some of the more interesting exhibits which were not described in our previous article on the Exhibition appearing in *The Mining Journal* of August 30, 1957.

The exhibit of *Sigmund Pumps, Ltd.*, was fully representative of the ranges of pumps developed by this organization to meet the needs of all types of industry.

The "G" range of single-stage self-priming pumps is designed to meet the requirements of industrial applications and has branch sizes from 1½ in. up to 8 in. and outputs up to 2,500 gallons per minute. This new Sigmund design offers a solution to the priming problems associated with centrifugal pumps, obviating pipe layout difficulties arising from the need for positive suction heads and the avoidance of "humps" in the suction line. In addition, the open type impeller employed in the "G" self-priming pump makes it an ideal unit for handling slurries and similar liquids.

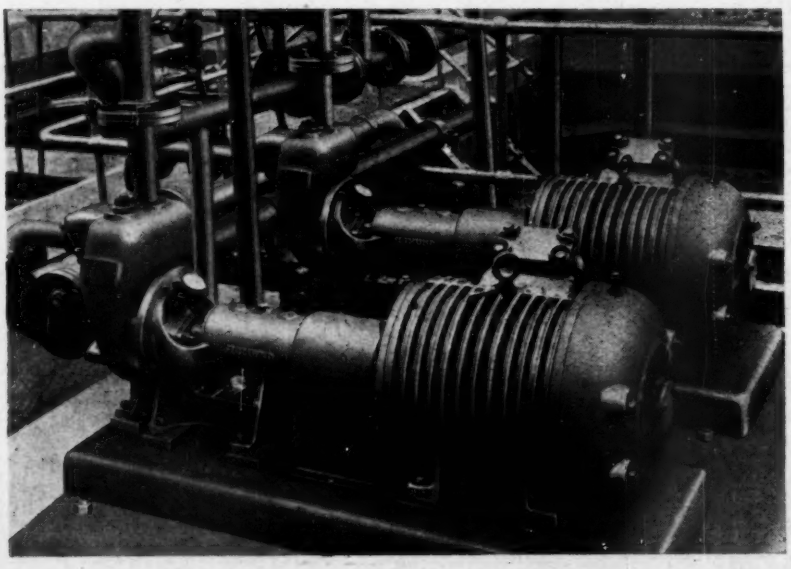
The *English Electric Co., Ltd.*, development of the canned motor pump was undertaken in collaboration with G. and J. Weir, Ltd., to produce the Weir-English Electric Canned Motor Pump. This pump was displayed at Olympia. Other exhibits by English Electric divisions included that of an 8 V drilling rig, skid-mounted, and a 4 S RKT traction unit. Various types of motors were shown by the Industrial Motor Division.

The *Dohm Group* gave Britain's first showing of high-tensile steel wire pellets for sheet blasting. The Group also showed a range of products varying from high carbon-content graphites to the world's cheapest plastic for foundry use.

The *David Brown Companies* showed amongst their exhibits the Size 5 David Brown Varicon for drives up to 5 h.p., a stepless speed reducer which in no way supersedes the Radicon Worm Reducer, but is a supplementary unit giving an infinite number of speed changes between 1/1 and zero, normal requirements being met by a reduction of 6½ to 1, while the major reduction and maximum torque are taken by the worm gear.

Metropolitan-Vickers Electrical Co., Ltd., occupied two stands at the exhibition. Stand 13, Row G, Grand Hall, was concerned with general products of the company, and Stand 4, Row X, Empire Hall, contained welding machines and associated equipment.

British Ropes, Ltd., showed ropes of PVC, nylon and their co-polymers, PVC corder wire ropes and cords, nylon-sheathed wire ropes and cords, and PVC sheathed wire ropes and cords.



The Sigmund type "G" self-priming pump

MINING MISCELLANY

Portugal's gold mine at Penedono, Viseu District, has been closed and the workers have been discharged. The Jales Mines (Vila Real district) seems to be the only gold mine in the country now operating on any scale.

★

Output of talc in Afghanistan totalled 900 s.tons in 1956, compared with 700 tons in 1955, 1,200 tons in 1954, and 800 tons in 1953. The talc mined in the eastern part, north of Safed Koh, is of best quality with a little iron. Reserves were reported to be more than 10,000,000 tons.

★

Authoritative quarters in Ankara have suggested that Turkey should set up a metal exchange. Studies to that effect have already started. It is believed that an exchange would help to improve Turkish export sales of ores and metals.

★

A Press report states that the United States company which has undertaken development of the Myconos barium mines in Greece will start operations in the near future. The United States Government is said to have guaranteed the investment of the capital involved.

★

International Minerals and Chemical Corporation plans to spend more than $20,000,000 on construction of a potash mine at Esterhazy, Saskatchewan, 150 miles east of Regina. The development area includes 450,000 acres, which I.M.C. controls under permit.

★

From Sierra Leone, Barclays Bank D.C.O. reports the discovery of molybdenite in the Wankatayna River on the west side of the Sula Mountain. Surveys of the deposit have been carried out and a report is to be submitted to the Government.

★

President Ruiz Cortines has approved a plan to establish a large metallurgical plant at Manzanillo on the Pacific coast. It is expected that this will lead to full exploitation of the reputedly immense iron ore reserves of Las Truchas in Michoacan, which were surveyed by Krupps last year.

★

Alcoa has curtailed production and employment at its two north-western smelting plants, following the suspension of power deliveries by the Bonneville Power Administration at midnight on August 31, due to shortage of water. Since September 1, one and one-third of five potlines at the Vancouver plant and one and one-third of four potlines at Wenatchess have been closed down.

★

A report from Helsinki states that the Finnish mining concern, Outokomu Oy., has decided to exploit the nickel ore deposits near Kotalahti. Mining activity is expected to be in full swing by the autumn of 1959 and annual output is expected to reach some 2,000 tons of nickel and about 1,000 tons of copper and other metals. It is understood that the company expects to be able to export its nickel at fair prices.

Bolidens Gruv Aktiebolag has decided to expand its lead mine at Vassbo, Idre, in the Province of Dalarna, Sweden. The expenses involved are calculated at about 16,000,000 kronor. The orebody is situated not more than 30 metres below the surface and the mine is expected to yield some 150,000 tons of ore per year, or about 12,000 tons of ore concentrate, with 74 per cent lead. The expansion will be completed in 1960.

★

The mining concern, Bureau de Récherches Géologiques, Géophysiques et Minières de la France Métropolitane (BRGGM) has been granted an exclusive prospecting permit for lead, zinc, silver and copper in the Niévre Department (central France). The permit is for three years and covers an area of 175.82 sq. kilometres. The BRGGM is committed to spend a minimum of 60,000,000 francs on its operations.

★

A report from East Africa refers to the probability that a much larger project than originally contemplated will be needed if the mineral complex at Sukulu in Uganda is to be exploited economically. Marketing problems are presented both for the apatite, which would need to compete with other phosphate sources for fertilizer production, and for the niobium secondary product, world demand for which might be insufficient to take up the necessarily enhanced production at Sukulu.

★

The first group of students, four veteran engineers, now pursuing post-graduate studies in the Department of Mining Engineering at the Technion, Israel Institute of Technology, Haifa, have been invited to spend two months in Italy for practical training in mining, mineral dressing, and prospecting for uranium ores. Earlier this year, they had been invited to Cyprus, where they inspected pyrites, chromium and asbestos mines. Since the Israel mining industry, still in its initial stages of development, has so far not had any underground mining activity, this new invitation to Italy will be of primary importance for the Technion group, whose studies in the Department of Mining Engineering have been sponsored by Israel Mining Industries, Ltd., the Dead Sea Works, and Solel-Boneh, the contracting organization of the General Federation of Labour.

★

Mr. Leslie M. Cassidy, chairman of Johns-Manville Corporation, has announced that the company will spend more than $40,000,000 this year on capital improvements. Capital outlays next year will drop well below the 1957 pace. Major plant construction to be completed in the remainder of the company's $58,000,000 programme includes six plants scheduled to go into operation in the next ten months. It was further stated that, although the company "has unquestionably the finest asbestos mine in the world" at Asbestos, Quebec, the yield per ton of ore had declined. Although this situation "could clear up in time", Johns-Manville is determining whether to develop its Jeffrey mine at Asbestos further or to develop new orebodies it owns in Canada. It is exploring for additional deposits, since world-wide demand for asbestos is increasing.

★

The report of the Central Land Board for the financial year 1956-57 points out that the Town and Country Planning (Minerals) Regulations, 1954, and the corresponding regulations for Scotland, require the board in calculating payments to have regard to the minerals worked within the claim unit up to the date of the Act or event giving rise to the payment, or where an application relates to development charge incurred, up to the date on which liability for development charge ceased. This means that most applications in respect of mineral-bearing land involve a new apportionment of development value. In some of the applications the circumstances were extremely complicated. Although many applications were found after detailed enquiries not to be affected by the special minerals provisions, the board issued 103 determinations adapted to those provisions in England and Wales and 18 in Scotland. Three notices of appeal were lodged, one of which was withdrawn. The other two are still outstanding.

★

An Iron Ore Export Group has been appointed in Brazil to "co-ordinate the studies, agreements and negotiations to be conducted by the government to stimulate the export of iron ore and its products".

★

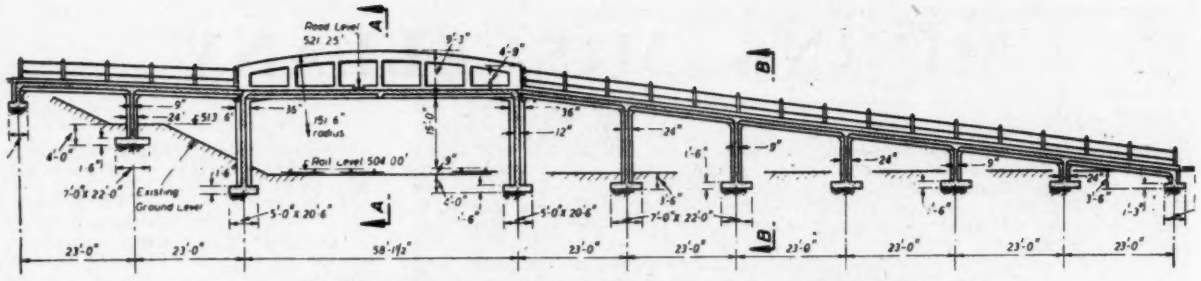
West Germany is making good progress in the race between coal production and demand. Output in 1956 was 134,000,000 tonnes and it is expected that an increase of 6,000,000 tonnes will be achieved this year. Further long-term mechanization plans and new sinkings are expected to raise the output of hard coal to 187,000,000 tonnes by 1960 and roughly 200,000,000 by 1980. These figures do not include production in the Saar field, which is currently running at about 20,000,000 tonnes per year.

★

Mr. Kikuo Yasuda, chairman of the Japanese Light Metals Association, has urged the Japanese Government to introduce an "obligatory transport system", whereby domestic refineries would be obliged to ship a certain percentage of their products abroad, even at the risk of inviting a shortage at home. Last year, local aluminium exporters found it very difficult to make new contracts with foreign consumers, because of a shortage in the supply of primary aluminium, owing to active domestic requirements and a drought which reduced electric power supply. The aluminium industry now contends that it must secure overseas customers for its products, regardless of the supply and demand situation in Japan.

★

Designed for one line of 6-ton capacity lorries, allowing for 50 per cent impact and having 12-ft. clear width, a new road bridge is being built over the railway sidings at Dodworth Colliery, near Barnsley. In the main span, which is 58 ft. long and gives 15 ft. headroom, the



The road bridge at Dodworth colliery, shown in longitudinal section

deck slab spans transversely between hog-back beams which have recessed panels to give the appearance of bow-string girders. Approach ramps comprising on the one side six spans and on the other side two spans each of 23 ft. are provided with precast concrete rails and posts. Fletcher and Co. (Ctrs.), Ltd., of Mansfield, are the contractors. The British Reinforced Concrete Engineering Co., Ltd., designed the reinforced concrete work and suppplied the reinforcement. The bridge was constructed to the general design and requirements of the National Coal Board's engineers.

PERSONAL

Mr. R. Bruce Dunfield, joint editor of *The Mining Journal*, sailed today for Canada and will attend the sixth Commonwealth Mining and Metallurgical Congress. While in the Dominion, Mr. Dunfield, himself a Canadian, will renew his personal contacts with the rapidly expanding mining industry of that country.

★

Mr. E. S. Hallett, of the Johannesburg organization of New Consolidated Goldfields, has been appointed a director of that company and of the Consolidated Gold Fields of South Africa, Ltd. He will shortly take up residence in London.

★

Mr. George Ansley has been appointed a director of the New Pioneer Central Rand Gold Mining Co., Ltd.

★

Mr. P. H. H. Jones has been appointed chairman of Mashaba Rhodesian Asbestos Co., Ltd., in place of the late Mr. Thomas Day.

★

Mr. Eric J. T. Goudie has been elected a director of the American Metal Co. in place of Sir Chester Beatty, who has retired. Mr. Frank B. Common has also been appointed to the board.

★

The Ministry of Industries, Ceylon, has obtained the services of Mr. H. Yamada, a Japanese mining engineer, as resident co-ordinating engineer on the State-owned ilmenite separating project. Mr. Yamada's services have been loaned by the Japanese Government under Colombo Plan technical aid.

CONFERENCES AND EXHIBITIONS

The first general meeting of members and associates of the Cornish Institute of Engineers, session 1957-58, will be held at the School of Mines, Camborne, at 7.15 p.m. on September 26, 1957.

★

The National Coal Board's eleventh annual summer school will be held at Oxford from September 7 to 14. During the week men from all the British coalfields will be living as students in five Oxford colleges. nearly 500 students representing all sections of the industry will attend the school.

★

The Iron and Steel Institute will hold a special meeting in Belgium and Luxembourg from June 18 to 28, 1958. It will be part of an International Meeting organized by the Centre National de Récherches Métallurgiques, Groupement des Industries Siderurgiques Luxembourgeoises, and Groupement des Hauts Fourneaux et Acieries Belges, on the general theme of "New Developments in Iron and Steel-making".

★

A course of three lectures by Sir Ronald Prain, O.B.E., chairman, Rhodesian Selection Trust, Ltd., will be given at Imperial College of Science and Technology, Royal School of Mines, South Kensington, S.W.7, at 5.30 p.m. on November 7, 14 and 26, 1957. The lectures deal respectively with "The Economics of Modern Mining", "The Responsibilities of a Mining Industry to the Community", and "The Development of the Copper Industry".

★

The latest geophysical equipment was displayed to the many scientists—more than a thousand—who met at Toronto for the eleventh general assembly of the IUGG (International Union of Geodesy and Geophysics), September 3 to 14. At Hart House of the University of Toronto, location of the meetings, a trade exhibit was staged by about 30 geophysical companies of Canada, the United States, Europe and other parts of the world. During the IUGG Assembly the Canadian International Air Show, September 6-7, displayed fixed-wing aircraft and helicopters, as equipped for air surveys and geophysical work.

★

With the presentation of the Capper Pass awards for 1957, the scheme made possible by Messrs. Capper Pass and Son, Ltd., of Bristol, for the award of prizes from funds made available by them—originally for seven years—has come to an end. Their intention was to stimulate the preparation of papers for publication in the *Journal* of the Institute of Metals and the *Transactions* of the Institution of Mining and Metallurgy, on metallurgical subjects; particularly on processes and plant used in extraction metallurgy in all branches of the non-ferrous metal industry and on the subject of assaying. Twenty-two awards have been made since 1948.

★

General meetings of the Institution of Mining and Metallurgy, during the 1957-58 session, will be held on October 17, November 21 and December 19, 1957, and on January 16, February 20, March 20, April 17 and May 15, 1958.

COMPANY EVENTS

In keeping with its policy to expand and improve services to Latin American clients, the Photographic Survey Corporation, Ltd., of Toronto, has joined with Venezuelan associates in the formation of Aeromapas Seravenca, of Caracas, Venezuela. Saravenca is claimed to be the most modernly equipped commercial air survey organization in South America.

★

During a brief visit to Britain after attending the European Molecular Spectroscopy Conference, Dr. Wilbur Kaye, director of research for Beckman Instruments, Inc., gave a lecture, illustrated by slides, on developments in the use of the near infra-red region in spectrophotometry and on various Beckman instruments. The lecture was given at the London showrooms of Baird and Tatlock (London), Ltd., who are agents for Beckman Instruments, Inc.

★

Pilot Works, Ltd., of Bolton, have appointed the S.M.T. Sales and Service Co., Ltd., their sole distributors for hydraulic tipping gears in Scotland.

★

The Newall Engineering Co., Ltd., of Peterborough, have announced the formation of a Canadian subsidiary, the Newall Machine Tool Corporation of Canada, Ltd. It is empowered to distribute in North America and to manufacture products of the parent organization.

★

A new subsidiary company, West's (Manchester), Ltd., has been formed by West's Gas Improvement Co., Ltd. The new company will deal with activities outside the gas industry, which have hitherto been carried on by the parent organization. These will include the production and marketing of screening plant, mechanical handling equipment and coal preparation plant, as well as design and manufacture of Flämrich PSH resonance screens, Wemco coal preparation plants, and other items in the Wemco range. The address of the new company will be Norton Street, Miles Platting, Manchester, 10, and the telephone number Collyhurst 2132.

★

The Overseas Development Administration in Lisbon will receive tenders up to October 31, 1957, for the concession of mineral prospecting rights in various areas of Angola and Mocambique.

Metals and Minerals

Growing Interest in the Newer Metals

Technological advances, by no means confined to the newer industries, have given an accelerating impetus to the development of materials capable of satisfying not only existing needs, but the still more exacting requirements of tomorrow.

Recognition of titanium's potentialities as an engineering material was followed by a rapid widening of interest in other once little-known metals with unusual combinations of properties. Zirconium and hafnium came into prominence in the nuclear field, while progress in electronics led to the development of germanium and silicon of semi-conductor grade. Faced with the need for alloys capable of retaining their strength and ductility at operating temperatures never previously encountered, designers of jet engines turned their attention to niobium and tantalum. New and potentially enormous outlets have arisen for boron and lithium in fuels for the propulsion of guided missiles, rockets, and even jet aircraft.

It can now be stated with confidence that there is no such thing as a useless metal, since every metal rapidly finds a growing field of applications once it can be made available commercially.

Titanium itself is still being produced on a scale which, by tonnage standards, is relatively small, though today it is large in comparison with that of the other newer metals. Outputs are being expanded very rapidly, however, and there are frequent reports of the establishment of new plants or extension of existing facilities.

From the United States came the announcement last week of a new $55,000,000 company, the Mallory-Sharon Metals Corporation, to be owned one-third each by National Distillers and Chemical, P. R. Mallory and Company, and Sharon Steel Corporation. Finalization of the new company, which will be the largest integrated firm in this field, is expected to take place some time in November. National Distillers will contribute to the new enterprise what the company believes to be the lowest cost process developed to date for the production of metal sponges (hitherto the cheapest titanium has been produced by I.C.I.). The process is said to be superior to the Kroll process in a number of important respects.

In 1956, National Distillers was awarded a contract by the Atomic Energy Commission to supply 500 s.tons of zirconium sponge annually for a period of five years. National has under construction a plant at Ashtabula, Ohio, for the production of titanium sponge, with design capacity of 5,000 tons of titanium and 1,000 tons of zirconium sponge annually. The zirconium plant will start operating some time this month and the titanium plant will come into production by the end of this year. Hafnium sponge will be produced as a by-product of zirconium. These plants, plus laboratory facilities, will be transferred to Mallory-Sharon Metals Corporation.

The new company is also expected to show considerable interest in columbium, because of the potential growth in demand for that metal in connection with projected gas-cooled nuclear reactors.

It is evident that as production gets into its stride, commercial development of the newer metals will have a profound impact on the pattern of distribution. Both in the United States and Britain, however, public interest has been slow to develop and implications from the standpoint of investors do not as yet appear to be very widely appreciated.

In this respect a timely step forward has been taken by the appearance of a circular issued by a leading firm of London brokers which is devoted entirely to the newer metals from the investment angle. An appendix to the circular gives properties, production and consumption statistics, and uses for no fewer than 36 metals, many of which had little commercial significance before the war.

While pointing out that, in general, direct investment in these materials is not possible, attention is drawn to a number of British companies engaged in the refining and fabrication of the new metals. The list includes I.C.I., Goodlass Wall (for its interest in British Titan Products), and Murex, as well as a number of concerns without whose equipment and processes the production of new metals would not be possible.

Several of the newer metals are, of course, referred to by Sir Arthur Smout, chairman of Murex, Ltd., in his statement circulated with the report and accounts for the year ended April 30, 1957. The company has plans in hand for the erection at Rainham of an entirely new plant for the production of pure tantalum and niobium powders. This plant is scheduled to come into production in 1959 and should be able to meet foreseeable user requirements for these products. Meanwhile current demands are being satisfied by the output from the company's existing pilot plant. Niobium, it is stated, was chosen as the canning material for the Dounreay fast breeder experimental reactor.

Murex has expanded its pilot plant for zirconium and the whole of the output is being sold in the United Kingdom. Its interest in beryllium is confined, at present, to the management of the U.K. A.E.A. Agency factory, which the company erected and staffed during 1950-52 under the aegis of the Authority.

U.S. ALUMINIUM "PUTS"

The United States Comptroller-General has ruled that Alcoa and Kaiser have the right to import aluminium from Canada and still hold the Federal Government to Korean War purchase contracts. These contracts were for a five-year period and guaranteed the Government purchase of aluminium at market prices if it became surplus. Alcoa and Kaiser entered into contracts with Canadian producers after the GSA contracts were signed in an effort to supply aluminium to meet United States demands before and after the war. The two companies have nevertheless agreed that in future they will deduct from the surplus metal they offer to the Government the equivalent of their imports from Canada. So far this year, Alcoa and Kaiser, with Reynolds Metals, have offered some 300,000 s.tons of metal, valued at about $150,000,000. The GSA purchasing agent has taken only part of this amount. The companies' voluntary action will doubtless tend to increase surplus supplies on the United States market.

★

The Prime Minister of Ghana, Dr. Kwame Nkrumah, said recently in the National Assembly that, while American and indeed "other interests" had continued to express an active interest in the Volta River project, the Government felt the time had come when a general review of the situation should be made with Aluminium, Ltd., of Canada, and a meeting would be held in a few weeks' time. He added that the Government intended to do everything in its power to bring the scheme to life.

★

Aluminium production in the U.S.S.R. is reported to be running at a high level. It is claimed that factories in the Urals, Siberia, the Lower Volga and other regions are "more than fulfilling" their planned output. One of the reasons given is the introduction of new techniques and instruments. Many plants, it is said, are now using the "spectral" method, which cuts down the time spent on the analysis of smelted aluminium to one-twentieth of what it was before. Plans call for the construction of more than 20 "powerful mechanized and automatized" factories for producing aluminium during the remaining years of the current Five Year Plan.

SHINE, SHINE, ALUMINIUM MOON

Moscow radio has disclosed that Russian scientists expect to launch two earth satellites shortly, including an aluminium sphere which will shine more brightly than a star of the first magnitude. This light metal satellite, to be launched shortly as part of the current International Geophysical Year programme, will be 25 in. in dia. and will weigh approximately 22 lb. when filled with instruments to send data back to earth.

RECORD TITANIUM ORDER

Titanium Metals Corporation of America has received the largest order for fabricated titanium in the history of the industry—seven miles of seamless titanium pressure tubing for chemical process application. The tubing—to be extruded in 2,130 sections each 17½ ft. long—will be used in eight kettle-type heat exchangers employed in processing nickel and cobalt ore at the plant which Freeport Sulphur Co. is to build at Moa Bay, Cuba. The tubing will be fabricated by Allegheny Ludlum Steel Corp., which owns Titanium Metals Corp. jointly with National Lead.

COPPER · TIN · LEAD · ZINC

(From Our London Metal Exchange Correspondent)

Markets this week have been overshadowed by the movements in the price of copper, as these have fluctuated very considerably and turnovers have been appreciable. The other three metals have been remarkably steady in spite of the weakness in the copper price.

COPPER PRICES RALLY

The copper market showed a declining tendency throughout the whole of last week, which in itself was unusual, and on Monday had a very sharp break to a low point of £185 per ton for forward delivery. Subsequently there was a recovery and at the time of writing it is difficult to say whether the market will remain at its present level or whether it will sink back again under the weight of surplus production. Monday's break can be attributed to the increase in stocks in the United Kingdom, lack of consumer demand, the second reduction in the RST price within a few days, and the general poor sentiment in the U.S. This was engendered by the weakness on Wall Street and the dwindling hopes of a major increase in consumption during the autumn, which resulted in the Customs Smelter price being reduced to 25 c. per lb.

The United Kingdom stocks at the end of last week showed an increase of 1,237 tons to a total of 16,133 tons, and the general opinion is that this rate of increase may continue for some weeks to come. Consumer demand in the United Kingdom and on the Continent failed to develop throughout the previous week's fall in price and although some more interest was noted on Monday, there are few reports of actual business being done.

Towards the end of last week the RST price was reduced by £10 a ton and again on Monday shortly after the opening of the market information was received that a further £10 reduction had been made, making the present price £190 a ton and as this was the first time that two reductions had been made within such a short space of time, this affected sentiment adversely: it is understood that the two Rhodesian producers have now made counter proposals to the British consumers in the matter of a uniform "fixed" price and that the consumers are now considering this answer, but no details are available of the course of the negotiations, although it is believed in some quarters that the whole scheme may be abandoned.

All the news from America is of a bearish nature as the Credit Squeeze on the other side of the Atlantic is causing a marked reduction in the amount of money being allocated by commercial concerns for capital equipment, and it appears that the Federal authorities are prepared to go on with their tight money policy for some time to come in order to combat the continued inflation which went on during the first half of the year. It seems at the moment as if there are two almost equal forces at work in the copper market, the first being the desire by a number of concerns to keep the price relatively stable in the hopes of encouraging buying by the large number of concerns which have kept out of the market as long as the price was falling, and those who feel that it is necessary for the market to go to very much lower levels to force producers to cut back production to a sufficient extent to equate output with actual consumption.

TIN REMAINS STEADY

The tin market has remained steady in spite of a slight falling off in demand as a number of people feel that the Buffer Stock Manager will recommence to buy metal before the limit of £730 is reached. On Thursday morning the Eastern price was £746.

IMPROVED OUTLOOK FOR LEAD AND ZINC

The lead and zinc markets have had a very firm undertone and the price of the latter has, in fact, tended to harden. It is considered that the cutbacks in production of zinc are now beginning to be felt. In fact, American Zinc Institute statistics show that a balanced position was achieved in August for the first time since early this year, despite a further drop in Government stockpiling. At the end of August stocks were 149,296 s.tons against 146,179 s.tons at end-July and unfilled orders 31,663 s.tons against 28,296 s.tons. August shipments rose to 81,049 s.tons from 73,055 s.tons in July. With demand remaining at a fairly good level, it is considered that should the American automobile industry commence the purchase of high-grade metal for their new model programme, there is scope for a further rise, always assuming that the tonnage of metal being exported from Iron Curtain countries is not increased.

The cutback in zinc production has automatically resulted in a lessening of the tonnage of lead available and as the statistical position of this metal has always been fairly good, this makes it possible that an upturn in price cannot be ruled out. In this connection it is worthwhile remembering that the amount of lead consumed by the battery trade is not so largely dependent upon the production of new models, but upon the number of cars in use. As the figure of the latter increases month by month, it is to be supposed that the amount of lead required will increase as the number of replacement batteries is likely to grow, as the average age of the cars increases.

Closing prices and turnovers are:

THE WEEK ON THE L.M.E.

	Sept. 5		Sept. 12	
	Buyers	*Sellers*	*Buyers*	*Sellers*
COPPER				
Cash	£195½	£195¾	£191	£191½
Three months	£198½	£198¾	£194	£194½
Settlement	195¾		£191½	
Week's turnover	8,100 tons		9,250 tons	
LEAD				
Current ½ month	£90½	£90¾	£89¾	£90
Three months	£90¼	£90½	£90¾	£90¼
Week's turnover	3,800 tons		3,675 tons	
TIN				
Cash	£735	£735½	£737½	£738
Three months	£737	£737½	£737½	£738
Settlement	£735½		£738	
Week's turnover	565 tons		700 tons	
ZINC				
Current ½ month	£72¾	£72¾	£74	£74¼
Three months	£72¾	£72¾	£74	£74¼
Week's turnover	4,650 tons		4,850 tons	

LONDON METAL AND ORE PRICES, SEPT. 12, 1957

METAL PRICES

Aluminium, 99.5%, £197 per ton
Antimony —
English (99%) delivered, 10 cwt. and over £210 per ton
Crude (70%) £200 per ton
Ore (60%) bases 20s. 0d./21s. 0d. nom. per unit, c.i.f.
Arsenic, £400 per ton
Bismuth (min. 1 ton lots) 16s. lb. nom.
Cadmium 11s. 3d. lb.
Cerium (99% nett), £13 18s. lb. delivered U.K.
Chromium, Cr. 99% 7s. 2d. lb.
Cobalt, 16s.-19s. lb.
Germanium, 99.99%, Ge. kilo lots 3s. 4d. per gram
Gold, 251s. 3½d.
Iridium, £27/29 oz. nom.
Lanthanum (98/99%) 15s. per gram
Manganese Metal (96%-98%) £310
Magnesium, 2s. 5½d. lb.
Nickel, 99.5% (home trade) £600 per ton
Osmium, £20/22 oz. nom.
Osmiridium, nom.
Palladium, £7 10s./£8 0s. oz.
Platinum U.K. and Empire Refined £31/£34 oz.
Imported £28 10s./£29 10s. nom.
Quicksilver, £85/£87 ex-warehouse
Rhodium, £42 oz.
Ruthenium, £15/£17 oz. nom.
Selenium, 75s. nom. per lb.
Silver, 78¼d. f. oz. spot and 78½d. f'd.
Tellurium, 15s. 16s. lb.

ORES AND OXIDES

Bismuth .. .. 65% 8s. 6d. lb. c.i.f.
18-20% 1s. 3d. lb. c.i.f.
Chrome Ore—
Rhodesian Metallurgical (semifriable) 48% .. .. £19 5s. 0d. per ton c.i.f.
" Hard Lumpy (45%) .. .. £19 5s. 0d. per ton c.i.f.
" Refractory 40% .. .. £13 0s. 0d. per ton c.i.f.
" Smalls 44% .. .. £18 0s. 0d. per ton c.i.f.
Baluchistan 48% .. .. £12 0s. 0d. per ton f.o.b.
Columbite, 65% combined oxides, high grade .. .. 185s./190s. 0d. per unit
Fluorspar—
Acid Grade, Flotated Material .. .. £22 13s. 3d. per ton ex. works
Metallurgical (75/80% Ca F_2) .. .. 156s. 0d. ex works
Lithium Ore—
Petalite min. 3½% Li_2O .. .. 47s. 6d./52s. 6d per unit f.o.b. Beira
Lepidolite min. 3½% Li_2O .. .. 47s. 6d./52s. 6d. per unit f.o.b. Beira
Amblygonite basis 7% Li_2O .. .. £26 5s. per ton f.o.b. Beira
Magnesite, ground calcined .. .. £28 0s./£30 0s. d/d
Magnesite Raw (ground) .. .. £21 0s./£22 0s. d/d
Molybdenite (85% basis) .. .. 8s. 5d. nom. per lb. (f.o.b.)
Titanium Ore—
Rutile 95/97% TiO_2 (prompt delivery) .. .. £49/£50 per ton c.i.f. Aust'n
Ilmenite 52/54% TiO_2 .. .. £11 10s. per ton c.i.f. Malayan
Wolfram and Schoelite (65%) .. .. 112s. 6d./117s. 6d. per unit c.i.f.
Manganese Ore Indian
Europe (46%-48%) basis 130s. freight plus 5% surcharge .. .. 131d./133d. per unit c.i.f.
Manganese Ore (43%-45%) .. .. 106d./108d. per unit c.i.f.
Manganese Ore (38%-40%) .. .. 100d./102d. per unit (including duty)
Vanadium—
Fused oxide 90-95% V_2O_5 .. .. £12½-£13½ per unit c.i.f.
Zircon Sand (Australian) (65-66% ZrO_2) .. .. £19 per ton c.i.f.

Mining Finance

Good O.F.S. Dividends

The first of the half-yearly Orange Free State gold-mining dividends to be issued, those of the Anglo American Corporation group, made a pleasing impression, being either in accordance with or above the forecasts. There had been little more than vague hopes about the possibility of Free State Geduld and Welkom making their maiden distributions.

The amounts of the latest payments and those for the three preceding half-years are shown below.

	Sept. 1957	Mar. 1957	Sept. 1956	Mar. 1956.
	s. d.	s. d.	s. d.	s. d.
F. S. Geduld	1 0	—	—	—
Presdt. Brand	2 6	2 6	2 0	1 6
Presdt. Steyn	1 6	1 3	1 0	9
Welkom	3	—	—	—
Western Hldgs.	3 0	2 0	2 0	1 6

It is particularly encouraging that some of the shares are now standing on quite attractive yield bases for young and growing mines that have plenty of expansion still before them and long enough lives for amortization of the wasting asset element not to be a vital factor at this stage. President Brand, for instance, at 51s. 9d., show a return of 9.6 per cent on the 5s. paid for the year to September 30, and President Steyn, at 28s. 3d., a yield of 9.7 per cent on the year's distribution of 2s. 9d. There is no double tax relief to be allowed for in calculating the yields because neither of these mines has yet reached the tax-paying stage.

Western Holdings at 72s. give the lower yield of 6.9 per cent on a 5s. basis, but it should be quite safe to take for yield purposes the 6s. annual rate represented by the latest payment. Earnings in the current quarter, even assuming that there will be no fresh advance in the September profit, look likely to be equivalent to 12s. 3d. per share per annum. On 6s., the Western Holdings' yield would be 8.3 per cent.

The maiden dividends by Free State Geduld and Welkom involve the distribution of £439,937 and £153,125 respectively. In actual fact, twice these sums will have to be provided by the companies out of earnings. Under the terms of the £1,500,000 loan that it initially obtained from Blinkpoort, Orange Free State Investment Trust and Transvaal Mining and Finance (the last-named has since been absorbed into the General Mining group), F. S. Geduld has to expunge this loan by amounts equal to any dividend payments. In a similar manner, Welkom has to redeem its £1,500,000 debenture issue in this manner.

R.S.T. GROUP COPPER PROFITS

Contrary to expectations, the June quarter profits before tax of Roan Antelope and Mufulira, the two principal copper producers of the Rhodesian Selection Trust group, were higher than those for the March quarter. The falling metal price had naturally led to market anticipations of still lower earnings. As it is, a spurt in sales during the final quarter of the companies' financial years saved the day and meant that the overall profit picture presented by the nine months' figures announced last May did not become worse for the full period.

The following table gives a clear picture of the course of events over the past year compared with the preceding twelve months.

	Profit 1956-57	Cumulative Totals 1956	1957
Roan Antelope:	£000's	£000's	£000's
Sept. Qtr.	1,925	2,855	1,925
Dec. Qtr.	1,917	6,442	3,842
Mar. Qtr.	1,482	10,656	5,324
June Qtr.	1,694	14,120	7,018
Mufulira:			
Sept. Qtr.	2,839	3,465	2,839
Dec. Qtr.	2,515	7,513	5,354
Mar. Qtr.	2,286	11,958	7,640
June Qtr.	2,450	15,984	10,090

The facts that the percentage falls in the year's surpluses were no greater than those for the nine months and that these were known when the reduced interim dividends for 1956-57 were decided upon in May, are leading to hopes that next month's finals will, therefore, show no greater proportionate cuts. These hopes, however, may not be fulfilled. For both concerns, so much depends on how much less the respective boards feel that they can put to reserves in a poor year, especially with the prospect of another relatively lean period looming ahead. Mufulira has a major expansion programme on hand towards the financing of which a £7,000,000 debenture placing was announced in July. Roan is building a new copper refinery. Both concerns have extensive loan commitments to the Rhodesian Government.

At the moment market estimates of the year's dividends appear to be that Roan might achieve a final of 15 per cent, making 25 per cent, Mufulira 23¾ per cent, making 40 per cent, and Rhodesian Selection Trust 21¾ per cent, making 35 per cent. These are not straightforwardly comparable with the 1955-56 payments, as they are on the capitals as increased by last February's substantial issues of fully-paid bonus shares. They would give yields (after allowing for the deduction of Rhodesian tax) which would be reasonable if there was a good prospect of the distributions being maintained for 1957-58. At the moment the prospect is very much the other way.

The course of the copper price itself will naturally continue to be the domi-

LONDON MARKET HIGHLIGHTS

In view of the persistent weakness of the copper price, it is hardly surprising that copper shares have been one of the most depressed sections of share markets this week. Dismal though the course of the metal was, the real decline in share values stemmed from the reduced interim dividend from Chartered with its disturbing implications for the near-term outlook for the metal. The Rhodesian Selection Trust group's June quarterly reports surprisingly showed an increase in profits over the previous quarter, but after a short-lived rally the share market resumed its downward trend. Chartered have dropped 7s. 9d. to 62s. 6d. and other substantial losses have been recorded throughout the list. Messina in particular have fallen 22s. to 112s. 6d.

Kaffirs have continued to droop, but again there has been no real selling pressure. At the same time buyers have been conspicuously absent and even the appearance of the good dividends from the Anglo American O.F.S. producers failed to stimulate any real interest. Consequently, Free State Geduld (75s.), President Brand (51s. 9d.), Welkom (15s. 3d.) and Western Holdings (72s.) have all lost ground despite their dividends. So too, have "Ofsits" (53s. 9d.), but at the time of writing there was a general feeling that a recovery in the market was near and for that reason there were occasional buyers at the lower levels for "Ofsits" on the theory that these shares would lead any revival in view of their big O.F.S. holdings and the increase in income that must accrue from the latest dividend declarations. Against the general trend, Vaal Reefs (3/s.) have been supported by Cape buyers and helped by the higher dividend President Steyn (28s. 3d.) have kept up well. Mining Finance shares tended to drift with the rest of the market, while in Diamonds De Beers (103s. 9d.) have been unsettled by Wall Street.

Tins lost ground on lack of interest, but hardened later on some encouraging dividend announcements. The Kepong payment lifted the shares to 6s. 3d. and also pleasing to the market was the Malaysiam return of 1s. capital and the shares appreciated to 1s. 3d.

Lead-zincs were inclined, rather illogically, to be overshadowed by the weakness of coppers. Consequently, Consolidated Zinc have eased to 67s. 9d. Elsewhere, the battle for control of London and Rhodesian seems to have reached its climax. The latest circular from Glazer Bros. again offering 14s. 6d. per share conditional upon a 51 per cent acceptance merely furthered the view that the bidders were unlikely to gain control and as a result "L. and R." have fallen back to 10s. 6d.

West African and Australian gold shares have generally drooped with Kaffirs, Ashanti easing slightly to 22s. 9d. In the miscellaneous group, tired speculative holders of St. John d'El Rey have been cutting commitments and in a rather narrow market the shares have fallen to 40s.

nant factor in the share market with the trend of Wall Street providing a background in both respects. Apart from this, over the next two months there are two events to come, neither of which is likely to be inspiring. In October there will be the final dividend season not only for the R.S.T. group but also for Rhokana and Rhodesian Anglo American of the Anglo American group. In the latter instance there are no quarterlies published to give a guide, but it may be assumed that their experience has been roughly the same as that of R.S.T., although there is one distinct difference. The "Rhoanglo" mines market their copper on the basis of London Metal Exchange quotations instead of fixing their own price as R.S.T. does.

The second factor will be the September quarterlies of the R.S.T. group due in November. These will almost certainly make a depressing showing. The sales spurt of the June period is hardly likely to be sustained, especially as the mines of this group have been making a voluntary 10 per cent cut in output since June 1. And there will have been a sharply lower copper price. Roan received £227 per ton of copper in the June quarter and Mufulira £237. The R.S.T. price was reduced to £220 at the beginning of the current three months and has since been lowered to £190.

CHARTERED CUTS INTERIM

Another aspect of the copper situation has been the cut from 1s. 6d. per 15s. stock unit to 1s. 3d. in the interim dividend for the year ending on September 30 of the British South Africa Company, or Chartered as it is commonly known. This reduction was unexpected. It had been thought that any lower distribution would have been reserved for the final payment due to be announced next February.

At the meeting last March the president said that on the basis of the £240 for copper then ruling it looked as though the company's taxed profits for 1956-57 would be in the neighbourhood of £4,500,000, against nearly £7,000,000 in the previous year. This would have amply covered the 5s. 3d. payment for that period, which required £2,644,577. Since March the copper price has dropped from £240 per ton to £190 and the Chartered Board has no doubt fallen into a conservative mood, especially in the light of the expressed intention to provide substantial sums each year to build up investments against the day, thirty years' hence, when the royalties from Rhodesian minerals will pass into the hands of the Government of that country.

Market expectations in the light of the reduced interim are that the final may be no more than 3s., making 4s. 3d. for 1956-57.

Ashanti-Obuasi. — The liquidator of Ashanti-Obuasi Reefs has announced that there are no funds available for shareholders and that the 1s. shares are now valueless. The total available for unsecured creditors was £1,655, and a first and final dividend of 9s. 9d. in the £ has been paid to such creditors.

Silvermines' Options. — Silvermines Lead and Zinc Co. remind holders of the company's 5½ per cent Unsecured Loan stock, 1960, of their option to convert into Ordinary shares at the rate of 16 of 1s. for every £1 stock held. This option is open from September 1 to October 31, 1957.

WAIHI INVESTMENTS & EXPLORATION, LTD.

The Twenty-First Annual General Meeting of Waihi Investments and Exploration, Limited, was held on Wednesday last at the Registered Office of the Company, 48 Gresham Street, London, E.C.2.

Mr. G. R. Mitchison, C.B.E., Q.C., M.P., Chairman of the Company, who presided, said:—

The Balance Sheet of this Company shows some minor changes since last year. As I mentioned at our last Annual General Meeting, £7,000 of our loan to Harrietville (Tronoh), Limited, now in liquidation, was repaid and the investment of that and previous repayments has resulted in a higher figure for quoted investments, which now stand at about £55,000. An investment reserve of about £2,000 represents profits on the realization of investments. There has been an increase of £3,000 in the loan to Fluorspar, Limited. There is no change in the position as regards unquoted investments, that is to say, our shares in the Harrietville company, which are only worth about £2,000, and as regards the loan to Waihi Minerals, Limited, which we consider largely irrecoverable.

The Profit and Loss Account shows a reduction of about £5,500 in interest and dividends on investments, as compared with 1955. That is because Puket Tin Dredging, Limited, did not have quite so good a year and in consequence declared dividends on its 2s. shares amounting only to 30 per cent for 1956, those for 1955 having totalled 37½ per cent. The decrease in those dividends was offset to some extent by dividends from other quoted investments. Because of the reduction in Puket's earnings there was a corresponding reduction in the directors' fees received by this Company. For the reason I mentioned last year we had to bear a larger share of administration and office expenses. In the result the net profit of this Company for the year amounted to £16,408, out of which a dividend of 10 per cent less tax has been paid at a cost of £14,257, and the balance carried forward has increased by about £2,000.

Fluorspar, Limited, made a small profit in 1956. The tonnage of acid grade fluorspar produced during the year was much the same as in 1955; but costs continued to rise and marketing difficulties were more pronounced, so that the stocks unsold at the end of the year showed a substantial increase. There has been some improvement in methods of extraction and every effort is being made to keep costs down and so to enable the product to be sold at a remunerative price.

In the current year the dredge at Puket continues to operate profitably and we may expect for the year results comparable with those for 1956. An interim dividend of 10 per cent less tax has been declared today, payable next month. It seems clear, however, that, as I forecast last year, the ground workable by the dredge will be exhausted next year, probably about the end of April. Puket Tin Dredging, Limited, will then be left with assets in Siam, including the dredge itself and some ground, which, though not workable by a dredge, is worked by local miners under tribute arrangements.

The report and accounts were unanimously adopted.

Mr. J. M. Mitchison, the retiring Director, was re-elected and the Auditors, Messrs. C. T. Moore and Company, reappointed.

METALLURGICAL ASSISTANT (SENIOR)—RHODESIA

A large copper mining group invite applications in connection with the above-mentioned vacancy in their research laboratory in Northern Rhodesia.

QUALIFICATIONS: A degree or equivalent qualification in metallurgy. Five years post-graduate experience in extraction metallurgy. Experience in mineral dressing, pyrometallurgy and research an advantage.

EMOLUMENTS: Basic starting salary would be in region of £1,200 p.a. There is also a cost of living allowance at present £65 p.a. and a variable bonus at present paying upwards of 20 per cent on basic salary.

PASSAGE: Employee's outward passage to Rhodesia paid by the Company.

ACCOMMODATION: Single quarters available immediately; married quarters available early 1958.

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There are generous life assurance and medical schemes. Send particulars of qualifications, experience and age to R.29, Mine Employment Department, Selection Trust Building, Mason's Avenue, London, E.C.2.

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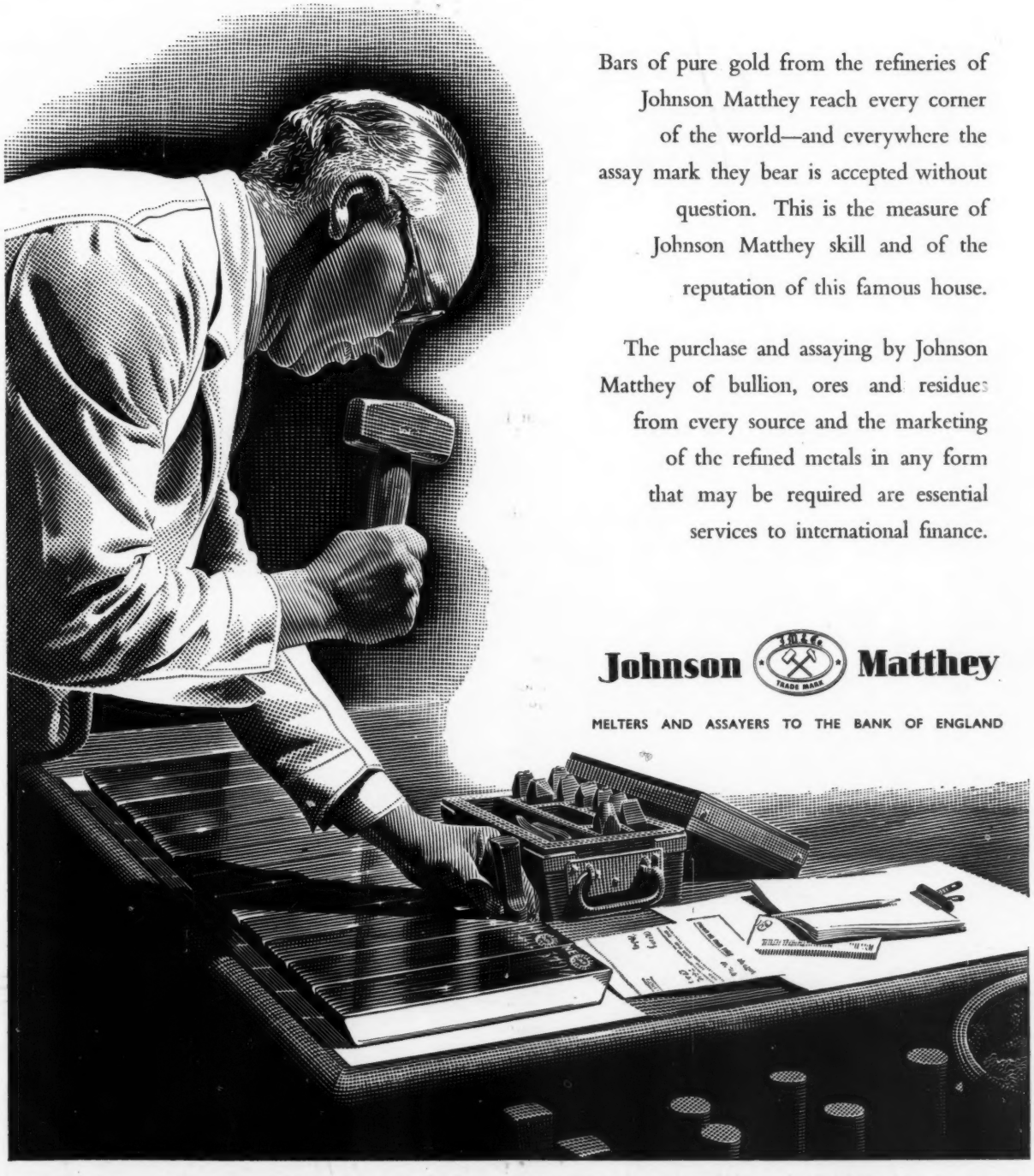

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GEEVOR TIN MINES

The forty-fourth Annual General Meeting of Geevor Tin Mines, Ltd., was held on September 11 in London.

Mr. G. W. Simms (the chairman) presided, and the following is an extract from his statement for the year ended March 31, 1957:—

The profit (before taxation) amounted to £102,670. After charging £58,153 to meet Taxation, and transferring £15,701 to General Reserve, the Directors recommend the payment of a Final Dividend of 1s. 6d. per Stock unit, together with a bonus of 3d. per Stock unit, making, with the interim dividend of 9d. per unit, a total distribution for the year of 2s. 6d. per Stock unit, less income tax.

The operating cost at the mine shows a reduction of 4s. per ton of ore milled as compared with the previous year. This reduction was largely due to the increased tonnage handled.

Penal Taxation of Cornish Industry

If the Cornish Tin Industry is to revive and prosper it is essential that Government should also play its part and recognize its obligations in this matter. All that is required is that it should recognize the penal nature of present mine taxation in the United Kingdom, and bring it more into line with that of countries such as Canada, Australia and the U.S.A. who fully realize that mine taxation operates on a wasting asset and make more adequate provision for that fact.

It seems odd that the United Kingdom Government, which is about to recognize the need for fostering overseas mining operations by the removal of taxation on mining companies registered here but operating abroad, has so far refused to recognize the equally great need of fostering and developing its own metal mining industry by taking the necessary action as regards mine taxation. This is all the more surprising in that by doing so both the Treasury and the Country stand to lose little but would undoubtedly gain much.

The report was adopted.

Rand & Orange Free State Returns for August

Company	August 1956 Tons (000)	Yield (oz.)	Profit† (£000)	Year ends	Current Financial Year Total to date Tons (000)	Yield (oz.)	Profit† (£000)	Last Financial Year Total to date Tons (000)	Yield (oz.)	Profit† (£000)
Goldfields										
Doornfontein *a*	85	34,727	192·1	J	170	69,462	373·3	141	55,660	240·0
Libanon	102	22,829	53·7	J	204	45,679	106·9	197	43,522	111·8
Luipaards Vlei *b*	77	13,631	4·5	J	150	26,535	L11·2	170	30,504	L23·6
Rietfontein	24	5,644	16·4	D	195	45,251	129·5	207	46,927	144·1
Robinson	78	16,221	13·0	D	603	123,077	74·7	629	127,222	25·8
Simmer & Jack	98	18,157	20·0	D	767	141,846	149·3	814	142,159	130·6
Sub Nigel	66	16,725	27·6	J	132	33,520	54·4	133	39,481	125·2
Venterspost	122	29,719	60·0	J	249	59,938	123·6	252	59,186	143·9
Vlakfontein	49	17,810	86·3	D	396	141,855	683·0	346	124,515	616·3
Vogels *a*	98	22,437	50·9	D	789	182,921	553·4	803	200,789	650·4
West Drie *a*	75	71,708	595·2	J	150	143,473	1230·5	150	138,732	1142·2
Anglo American										
Brakpan	112	18,985	16·4	D	857	146,146	105·6	856	14,563	103·3
Daggas *a*	229	49,444	272·0	D	1,826	400,604	2194·2	1,758	398,405	2254·8
East Daggas	94	15,612	35·3	D	759	125,477	277·0	754	125,645	279·1
F.S. Geduld *c*	162	43,273	301·8	S	582	610,750	1931·2	307	113,504	341·1
Loraine *a*	65	12,838	L5·4	S	691	134,466	L69·1	508	87,964	L250·8
President Brand *a*	70	52,112	427·4	S	695	528,879	4342·1	592	466,599	3845·6
President Steyn *a*	96	35,890	200·5	S	1,002	384,653	2184·3	954	356,704	2044·6
S.A. Lands	92	18,504	58·5	D	722	153,506	516·9	717	148,319	489·2
Springs	127	14,087	8·0	D	1,012	110,201	48·7	1,008	122,695	84·9
Vaal Reefs *a d*	67	30,084	181·4	D	481	211,332	1251·5	190	66,746	295·2
Welkom *a*	83	23,827	61·1	S	942	199,176	553·0	926	203,975	348·1
Western Holdgs.	103	52,007	385·6	S	1,042	488,464	3303·3	846	338,795	2047·2
West Reef Ex. *a*	121	26,730	67·8	D	977	212,111	517·6	958	292,308	377·7
Central Mining										
Blyvoor *a*	107	63,931	467·2	J	216	128,352	938·0	223	124,672	924·5
City Deep	151	29,443	14·3	D	1,187	234,233	135·1	1,213	235,103	23·2
Cons. M.R.	170	24,180	10·0	J	338	48,294	20·0	345	47,834	21·6
Crown	240	34,390	5·3	D	1,915	279,068	L6·7	2,300	358,272	211·8
D. Roodepoort	185	32,515	51·1	D	1,468	257,536	412·1	1,460	251,779	415·9
East Rand Prop.	235	56,767	142·3	D	1,745	449,353	1035·7	1,699	438,632	1424·8
Harmony *a*	89	35,155	181·5	J	177	70,369	371·3	158	62,844	350·2
Modder East	144	14,562	4·0	J	289	29,052	8·0	283	28,779	18·1
Rose Deep	50	7,201	0·5	D	397	60,180	3·0	354	57,084	8·1
J.C.I.*										
E. Champ d'Or *a*	12	345	L26·7	D	97	2,719	L212·4	114	7,375	L214·8
Freddies Cons. *a*	58	17,322	L4·0	D	460	121,457	L141·2	489	98,347	L307·3
Govt. G.M.A. *a*	62	11,009	0·9	D	838	141,249	L64·0	1,900	239,448	15·9
Randfontein *b*	49	7,958	1·7	D	576	95,991	77·6	—	—	—
Union										
East Geduld	139	42,293	301·0	D	1,108	340,112	2399·5	1,154	356,359	2540·6
Geduld Prop.	93	14,755	22·8	D	804	127,464	204·6	832	132,318	264·6
Grootvlei	205	43,676	235·9	D	1,561	334,005	1760·1	1,564	337,187	1836·4
Marievale	74	19,354	88·6	D	571	149,873	674·1	569	149,315	689·2
St. Helena	120	34,802	194·9	D	932	271,516	1499·2	848	246,250	1331·9
Van Dyk	80	14,168	17·4	D	623	106,467	67·1	643	104,365	12·3
General Mining										
Buffelsfontein *a e*	112	36,334	176·9	J	222	72,614	352·7	—	—	—
Ellaton *a*	33	7,235	26·1	D	261	56,000	141·6	256	59,349	232·8
S. Roodepoort	31	7,121	26·6	J	61	14,191	52·3	59	13,690	50·3
Stilfontein *a*	108	51,300	348·2	D	794	352,546	2256·8	709	277,832	1643·5
W. Rand Cons. *b*	140	19,275	9·8	D	1,146	165,576	131·6	—	—	—
Anglo-Transvaal										
Hartebeestfontein	86	47,730	330·4	J	172	95,030	652·8	133	64,508	375·8
N. Klerksdorp	11	1,223	L6·0	D	84	9,869	L45·1	86	9,911	L40·6
Rand Leases	167	26,553	9·9	J	341	54,219	22·4	368	56,304	11·7
Village M.R.	34	5,627	7·3	J	68	11,271	14·7	68	10,185	17·9
Virginia O.F.S.	101	27,018	73·1	J	202	53,940	144·2	173	40,189	105·0
Others										
N. Kleinfontein	105	12,377	0·5	D	795	92,632	L46·1	843	99,205	16·5
Wit. Nigel	18	4,290	7·4	J	36	8,593	15·3	36	7,978	14·5

Gold has been valued at 250s. 11d. (July 250s. 4d.) per oz. fine. L indicates loss. †Working Profit. *Working Profit includes sundry revenue. *a* Excluding revenue from Uranium, Acid and Pyrite. *b* Gold Division only. *c* Production began January 1956. *d* Production began May 1956. *e* Production began January 1957. Operations at Merriespruit remain suspended.

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E. W. MORGAN, Secretary.

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September 9, 1957.

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